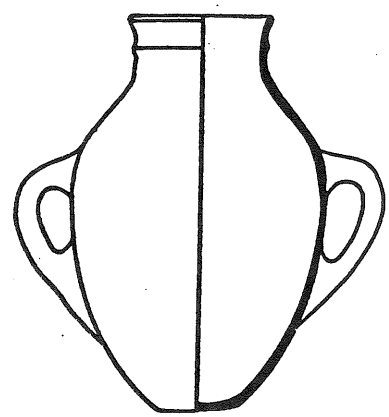
The Foreign Relations of the "Hyksos"

A neutron activation study of Middle Bronze Age pottery from the Eastern Mediterranean

Patrick E. McGovern

With a contribution by

Tine Bagh



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The Foreign Relations of the "Hyksos": A neutron activation study of Middle Bronze Age pottery from the Eastern Mediterranean

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Cover illustration: Middle Bronze IIA Canaanite Jar from Beth Shan, Israel, Level XI, Locus 1824B, excavation no. 33.9.287. A dark red residue on the interior bottom half of the half-sized amphora was analyzed in the author's laboratory, and determined to have contained resinated wine (see Chapter 6, for analytical methods and discussion). Length: 26.5 cm. (Courtesy of the University of Pennsylvania Museum of Archaeology and Anthropology, museum no. 34-20-349.)

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Fresco showing large and small sealed amphoras being transported into the treasury of Amun, from the tomb of Rekhmire (TT100), western Thebes, dating to the reigns of Tuthmosis III-Amenhotep II, 18th Dynasty. After N. de G. Davies, *Paintings from the Tomb of Rekh-Mi-Re at Thebes* (New York: The Metropolitan Museum of Art, 1935), pl. 15; courtesy of The Metropolitan Museum of Art, New York, no. 30.4.151 (facsimile painting by C. K. Wilkinson), Rogers Fund, 1930.

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PREFACE

This volume was completed, submitted, and formally accepted for publication by the Austrian Academy of Sciences in the summer and fall of 1997. It was positively reviewed and approved for publication by Dr. Manfred Bietak at that time. Since funding could not be secured for the publication during the second stage of the process and other issues arose which were not adequately explained, the manuscript was subsequently withdrawn and returned to me, with the stipulation that the Academy had no objection to it being published elsewhere. This delay of three years was partly alleviated by the expeditious and excellent handling of the book by Dr. David Davison, Dr. Rajka Makjanić and their staff at Archaeopress.

It should be stressed that Dr. Bietak, through the auspices of the Austrian Academy, graciously enabled me to study and prepare materials from Tell el-Dab`a for publication during several extended periods at the Austrian Institutes in Cairo and Vienna. Dr. Bietak personally checked the stratigraphy and dating of the published and unpublished pottery from the site reported on here. In the interim since this study was completed, however, some reassessments may have occurred, and the reader is advised to consult more recent publications.

The archaeological data from Tell el-Dab`a are crucial for interpreting the NAA data for the whole of the Eastern Mediterranean. Moreover, the types of pottery vessels, their archaeological contexts and dating, and fabric assignments according to the Vienna System are essential for properly evaluating the origin or provenience of the pottery from this site. Archaeological chemistry, like the other archaeological sciences, can only produce useful results if it is fully integrated with archaeology (McGovern 1995), in the spirt of "middle-range theory" (Sabloff, et al. 1987). At the same time, this study transcends any particular site, and is highly relevant to Middle Eastern archaeology and archaeological chemistry in general.

It would have been most desirable to include the pottery line-drawing plates for the Tell el-Dab`a pottery in this volume, since they conveniently summarize the details and nuances of the pottery typology. I had a substantive, creative input into the preparation of these figures–checking their accuracy, establishing straight-forward, informative conventions, and working closely with the artists to bring this part of the project to completion. They were also approved by Dr. Bietak. In the end, however, it was deemed best not to preempt Dr. Bietak in making this material available to the scholarly world. Many readers will have access to primary sources, so that they can consult drawings of the published pottery. From these, they can infer what typological variations are being described in the text. The pottery plates included elsewhere in this volume provide additional help; permission to use them was generously given by the Kunsthistorisches Museum in Vienna. Appendix 1 should also be consulted for information about each artifact. When these resources and inferences prove inadequate, the interested reader is kindly requested to write directly to Dr. Bietak c/o the Austrian Archaeological Institute, University of Vienna, Frankfasse 1, A-1090 Vienna, Austria (FAX: 43-1-405-430090; e-mail: **manfred.bietak@univie.ac.at),** to obtain copies of the pottery figures. For similar reasons, a number of maps were omitted. Published citations are noted, and they can again be requested from Dr. Bietak.

The pottery from Tell el-Dab`a belongs to the Egyptian Antiquities Service, the country of Egypt, and its people. As professional archaeologists and scientists, we can do no less than fulfill our responsibility to Egypt, the funding agencies and numerous colleagues and institutions around the world who contributed samples and information from other sites throughout the Middle East, to publish our results in a timely fashion. It is the goal of this study to provide a unique compositional database, together with new perspectives on Hyksos culture, trade and technology, and hopefully to stimulate and serve as a touchstone for future Levantine pottery studies during the Middle Bronze Age.

FOREWORD

The large-scale Neutron Activation Analysis (NAA) project that is detailed in this volume was begun by Mrs. Joan Huntoon. As a Ph.D. candidate in the Department of Art History and Archaeology at Columbia University, under the supervision of Professor Edith Porada, she decided to focus on the origins, distribution, and trade of Middle Bronze Canaanite Jars or amphoras for her dissertation. Tell el-Dab`a, the ancient "Hyksos" capital of Avaris that has been excavated over the past twenty years by Dr. Manfred Bietak, was clearly a stratigraphic and chronological benchmark for the whole of the Eastern Mediterranean. In order to control the material from this sites, Joan participated in several field seasons there. Her project soon expanded to include other characteristic Syro-Palestinian types besides Canaanite Jars, including highly Polished and slipped vessels, Tell el-Yahudiyeh jugs and juglets, Levantine Painted Ware, together with a range of Egyptian and Cypriot types and modern clays. Joan also travelled widely in the Middle East and Europe to other archaeological sites and museums, to collect reference pottery groups from sites up and down the coast and in inland Palestine and Syria. Back at Brookhaven National Laboratory, in collaboration with Dr. Garman Harbottle, she processed 1104 samples. Sadly, she never lived to see the fruition of her labors. Having carried out a considerable amount of background research, her health went rapidly downhill and she died in the Fall of 1987.

I had long collaborated with Joan and Gar at Brookhaven, and, with the concurrence and avid support of Drs. Porada and Bietak, Gar and I undertook to complete the research that Joan had begun. Joan's husband, Robert, was able to locate a sizable portion of Joan's records that had been missing, and personally delivered these to me in Philadelphia. Based on the NAA data that Joan had already compiled, the standard battery of Brookhaven programs--Euclidean distance searches, Mahalanobis distance probabilities of group membership, hierarchical aggregative clustering, etc.--were run. As it turned out, in October 1988, both Gar and I discovered virtually simultaneously that much of the Tell el-Dab`a pottery of Syro-Palestinian type had been produced in Southern Palestine and exported to the Delta. Even in the pre-Web days of the 80's, we were still able instantaneously to communicate our results to one another by electronic mail. Even after sending a detailed letter to Dr. Bietak of this remarkable finding, there was much to be done to understand those samples that had other origins, subject the statistical results to more rigorous analysis, establish local chemical reference groups for the pottery from numerous other sites, explain apparent discrepancies between the NAA and the archaeological results, carry out contextual, typological, and comparative studies, detail pottery fabric and fabrication technique, finalize drawings, photographs and plans, and most importantly, write this text. The University of Pennsylvania Museum and its directors, Drs. Robert H. Dyson and Jeremy A. Sabloff, and the Museum Applied Science Center for Archaeology (MASCA), under the direction of Dr. Stuart J. Fleming, enabled me to devote large blocks of time to the "Hyksos Neutron Activation Analysis Project," which had the potential of establishing an NAA database for many other sites and periods of the ancient Near East. A number of Tell el-Dab`a Canaanite Jars with visible interior residues were also subjected to a range of organic analyses, for determining their original contents, as part of MASCA's Archaeochemistry Program which I direct.

Since the Tell el-Dab`a records and artifacts are stored in the Austrian Institute in Cairo and the Institute for Egyptology in Vienna, as well as the Cairo Museum and the Kunsthistorisches Museum in Vienna, I joined the Dab`a expedition in 1988, 1991, and 1994, stopping off once in Vienna on my return to the States. The Austrian Academy of Sciences enabled me to devote myself to the completion of the manuscript at the University of Vienna in the Spring and early Summer of 1997. Periods of research were also spent in the British Museum, the Ashmolean, the Louvre, and museums in the Middle East--the Rockefeller in Jerusalem and the National Museums of Jordan and Syria--to recheck the pottery that Joan had sampled and collect additional documentation and illustrations. In conjunction with more NAA analyses of problematic ware types and unique vessel types at Tell el-Dab`a, a range of auxiliary NAA projects were carried out, first in collaboration with Gar at Brookhaven and since 1991 at the University of Missouri (Columbia) Research Reactor (MURR). These projects enabled local chemical reference groups to be established for Amman, Ashkelon, the Baq`ah Valley sites of Jordan, Beth Shan, Hama, Kabri, Tell Mardikh/Ebla, Tell Abu al-Kharaz, and Tell es-Sa`idiyeh, as well as Thebes in Egypt. The local groups at Tell Beit Mirsim and Jericho were also firmed up by more analyses. Additionally, the local chemical profile of ancient pottery and a modern clay source, exploited in antiquity, was established for a very recently excavated site, Tell el-Fukhar in northern Transjordan, where I served as the pottery and stratigraphic consultant of the Joint Scandinavian Expedition. Many of these analyses are yet unpublished, but provide the essential framework for evaluating the imports to Tell el-Dab`a and enter into the discussion in this volume to some extent (e.g., the local group and sample information for Ashkelon, Ebla, Tell el-Fukhar, and Thebes are included in Appendix 2).

The nurturing and genesis of this volume is due to the generosity, assistance, and advice of many individuals and institutions. Foremost, Dr. Manfred Bietak is to be thanked for his ongoing support of the project, stimulating discussions of the material, and for providing information about the archaeological context of each sample. In Cairo, the staff of the Austrian Institute, especially Mrs. Renate Hassanein, arranged various practical matters and helped to make my stays there very pleasant and productive. The staff of the Vienna institute, including Mrs. Christa Rustwurm and Irene Kaplan, has been equally helpful. Elisabeth Majerus in Cairo and Nicola Math and Vera Müller in Vienna are primarily responsible for the numerous pottery drawings and their layout as figures. Photographs of pottery vessels in the Kunsthistorisches Museum in Vienna were

arranged by Dr. Helmut Satzinger, Elfriede Haslauer, and Roswitha Egner. Some of the fabric assignments and registration entries were rechecked by Dr. Irmgard Hein, who also greatly facilitated the final period of preparing the manuscript in Vienna. Other colleagues from the Tell el-Dab`a team who have shared freely of their knowledge and expertise include Drs. David Aston, Josef Dorner, Peter Jánosi, Angela Schwab and Ursula Thanheiser, and Karin Kopetzky. Discussions with Axel Pape of the Tell el-Dab`a team and Dr. Gerwulf Schneider of the Free University of Berlin, who are carrying out an X-ray fluorescence spectroscopic study of primarily Egyptian-type pottery from Tell el-Dab`a, were illuminating in demonstrating the comparability of our data for fifteen samples, to the extent that is possible using two different analytical techniques. I am also most grateful to Dr. Johanna Holaubek, whose hospitality and assistance made my stay in Vienna a memorable one.

At museums and collections in Europe, Dr. Annie Caubet of the Department of Oriental Antiquities of the Musée du Louvre, Dr. Peter J. Parr, Pamela Magrill, Jolanta Kuter and Anne Wilson of the Institute of Archaeology of the University of London, Drs. Terence C. Mitchell, Jeffrey Spencer and Jonathan N. Tubb and Kay Cummins of the British Museum, Dr. Ingolf Thuesen of the Carsten Niebuhr Institute of the University of Copenhagen and the National Museum, and Dr. Helen Whitehouse of the Ashmolean Museum greatly facilitated my work. Dr. Jean-Paul Thalmann, director of research of the Centre Nationale de la Recherche Scientifique in Paris, provided detailed information on samples from Tell `Arqa and a microfiche copy of his recently published dissertation on his excavations there.

In the Middle East, samples with registration information were kindly provided by Dr. Mohammed Najar, the National Museum in Amman and the regional museums of Salt and Irbid (Amman Citadel, Baq`ah Valley, Gibeon, Jericho, Tell Abu al-Kharaz, and Tell el-Fukhar), the Museum of Archaeology in Kerak (Bab edh-Dhra`, Feifa, and Safi), Dr. Mo`awiyeh Ibrahim and the Institute and Museum of Archaeology and Anthropology at Yarmouk Univerity (Sahab), the National Museum in Damascus (Tell Kazel and Mtouné), the Idlib Museum (Tell Mardikh/Ebla), Joseph Zias and Ruth Peled and the Rockefeller Museum in Jerusalem (Megiddo, Tell el-`Ajjul, and Tell Beit Mirsim), Dr. Pirihiya Beck and Esther Yadin and the Institute of Archaeology at Tel Aviv University (Tel Aphek), and the University of Pennsylvania Museum (Baq`ah Valley, Beth Shan, Gibeon).

Individual archaeologists and scientists who provided pottery and clay samples include Drs. Dorothea Arnold and Susan J. Allen (Dahshur and Thebes), Dr. Adnan Bounni (Tell Ibn Hani), Dr. Günter Dreyer and Ulrich Hartung (Abydos), Dr. Peter M. Fischer (Tell Abu al-Kharaz), Dr. Samuel M. Paley (Tel Ifshar), Dr. Aharon Kempinski (Kabri), Drs. Paolo Matthiae, Stefania Mazzoni and Frances Pinnock (Tell Mardikh/Ebla), Dr. Eliezer Oren (Tel Haror), Dr. Pamela J. Rose (el-Amarna), Drs. Lawrence E. Stager and Joseph A. Greene (Ashkelon), and Dr. Sami Tobias (Giza and Qasr el-Sagha).

A special word of appreciation must go to Dr. Garman Harbottle at the Brookhaven National Laboratory. Gar ran the last several hundred samples that Joan had prepared for analysis. Most importantly, he assembled Joan's records and brought them to Philadelphia, where he also instructed me in the use of the Brookhaven statistical programs. As mentioned above, our analysis of the Tell el-Dab`a NAA data led to the same conclusions, nicely confirming one another. When Brookhaven's NAA operation was scaled back, he encouraged me to contact Dr. Michael D. Glascock, director of the MURR facility. Mike and his colleague, Dr. Hector Neff, have been extremely helpful, not only in preparing, with the help of student interns (viz., Danielle Parks, Emma McKinnon, and Shannon Flynt) and running some 500 additional NAA samples, but also advising me on and providing me with upgraded Brookhaven programs capable of running under DOS. Hector has developed a series of GAUSS programs (in particular, Principal Components Analysis using R- and Q-mode analysis, and also including factor analysis, Mahalanobis distance probability calculations with and without the given sample included in the group, etc.) that are extremely useful, with the data being readily displayed as two- or three-dimensional graphs (e.g., Figs. 3-21 in this volume). Financial support for the Brookhaven analyses was provided by the U.S. Department of Energy (contract DE-AC02-76CH-00016), and for the MURR analyses by the National Science Foundation (Grant nos. BNS-8801707 and DBS-9102016). Additional support has been provided by The Research Foundation of the University of Pennsylvania, the National Endowment for the Humanities, the National Geographic Society, the Danish Palestine Exploration Fund (Hjerl), the German Archaeological Institute in Cairo, Missione Archeologica Italiana a Ebla, the Associates of Biblical Research, and the Metropolitan Museum of Art.

Many other scholars have contributed to the success of this project, including M. Artzy, P. Åström, C. W. Beck , P. P. Betancourt, J. Bourriau, L. J. Exner, D.L. Glusker, Y. Goren, J. S. Holladay, Jr., M. J. Hughes, A. Leonard, Jr., C. Lilyquist, E. Marcus, A. Mazar, A. Meier, R. S. Merrillees, D. B. O'Connor, E. Oren, L. Nigro, W. E. Rast, R. T. Schaub, J. Strange, J. W. Weinstein, B. G. Wood. My heartfelt thanks to all of them and any others whom I may have unintentionally overlooked.

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Chapter I

INTRODUCTION

The enigmatic "Hyksos" (Egyptian *hk3w h3swt*--"rulers of foreign lands") controlled Lower Egypt and parts of Middle Egypt for over a hundred years during the Second Intermediate Period (ca. 1650-1550 B.C.). Political dominance by non-Egyptians rarely occurred in ancient Egypt, because it was cut off from Southwestern Asia by the Sinai peninsula and by deserts from other parts of Africa. The origins of these Semitic-speaking "Hyksos" in Egypt and their rise to power thus has been and continues to be a hotly debated topic (see Van Seters 1966; Bietak 1986, 1991a, 1994, 1996; Oren 1997). Were their ancestors the Asiatic servants and other groups described in Middle Kingdom texts, who then increased in population and took advantage of native Egyptian weakness during the 13th and subsequent dynasties (Van Seters 1966: 87-96, 191-93)? Or were they invaders from the Levant, as described in later secondary accounts and implied on contemporaneous Egyptian monuments? For example, Josephus, citing Manetho, writes that the Hyksos were "men of ignoble birth out of the eastern parts [Syria-Palestine], and had boldness enough to make an expedition into our country, and with ease subdued it by force" (Josephus, *Contra Apion*, sect. 14). The contemporaneous second Kamose stela states that the Hyksos had as their leader the "vile Asiatic," "the ruler of Retenu [Syria-Palestine]" in their capital city of "Avaris in the two rivers," i.e., at a confluence of two channels of the Pelusiac branch of the Nile River (Habachi 1972: ll. 4, 16, and 17; Bietak 1991a: 28, figs. 1, 2 and 5, and 1994: 37-38, fig. 18, based on a program of systemic borings by J. Dorner).

Tell el-Dab`a, as the ancient Hyksos capital of Avaris in the northeastern Nile Delta (Bietak 1986, 1991a, 1994, and 1996), has and will continue to hold a prime place in the ongoing discussions and debates. Tell el-Dab`a is particularly pivotal, because it provides a stratified sequence of occupational and burial remains from the late 12th Dynasty of Egypt (late Middle Kingdom) through the 17th Dynasty (the end of the Second Intermediate Period) that can be correlated with contemporaneous developments elsewhere in the Levant and Egypt. Bietak has shown that the major strata and sub-phases of Tell el-Dab`a fit well with Middle Bronze (MB) sequences at other sites in the Eastern Mediterranean, albeit that the Dab`a assemblages have a higher percentage of native Egyptian material and a distinctive Syro-Palestinian artifactual repertoire.

Contemporaneous inscriptions from Tell el-Dab`a are relatively few and shed limited light on historical and cultural developments during the Middle Bronze Age (see Bietak 1991a, 1994, and 1996). However, additional information about the role of the Hyksos at Tell el-Dab`a and especially their connections with the Levant can be gleaned by other methods. For example, physicochemical characterization of a range of archaeological materials from an archaeological site, locational analysis, ethnoarchaeology, palaeogenetics, and many other approaches have proved invaluable in reconstructing craft activity and organization, socio-economic structure and development, ethnic affiliations, foreign relations, diet and disease, etc. (see McGovern 1989 and 1995). To some extent, these methodologies have already been applied to the Dab`a material (e.g., for an evaluation of the physical anthropology of the population, see Winkler and Wilfing 1991), but much remains to be done.

In this monograph, Neutron Activation Analysis (NAA), a very precise physico-chemical technique, is used to measure the chemical compositions of the pottery wares for several principal Syro-Palestinian pottery types at Tell el-Dab`a: the so-called "Canaanite Jar" or amphora, Polished Jugs, Juglets and Bowls, Painted wares, and Tell el-Yahudiyeh jugs and juglets. A range of Egyptian, Cypriot and Minoan types and modern clays were also analyzed. Statistical evaluation of the data enables the vessels to be "fingerprinted," i.e., the source(s) of the clay(s) from which they are made and their place of manufacture, to a high degree of probability, are established. The contexts in which vessels of a particular class were found and their stylistic affiliations are also assessed. Although NAA provenience data for the Tell el-Yahudiyeh jugs and juglets are included in the tables and charts published here, their full treatment and illustration is reserved for a volume in the Tell el-Dab`a series, now being prepared by M. Bietak.

By considering all the lines of available evidence--NAA provenience, context, style, fabric assignment, even the organic contents of some vessels--the trade relations between Tell el-Dab`a and other parts of the ancient world, which bear significantly on the economy--even the ethnic origins--of the "Hyksos," can then be reconstructed (see Chapter 6).

1. The Cultural and Archaeological Setting

The Middle Bronze Age (MBA) in the Eastern Mediterranean, dating from about 1900/1875 to 1550 B.C., was a period of dramatic expansion in the urban civilization of the Levant (Van Seters 1966; Dever 1976 and 1987; Bietak 1986, 1991a, 1994, 1996). While this author would eschew exact dates until more radiocarbon and/or epigraphic evidence is available, the dates cited here follow the so-called "middle chronology" (Weinstein 1992; also see Kitchen 1987: 43-44, 47, tables 1 and 2, and 1989: 152-53), rather than the lower chronology of the site's excavator (Bietak 1989b, 1991, and 1996). The difference amounts to only about 25-50 years, in any case. As much as two centuries separate the lower chronology from the high and ultra-high chronologies (Dever 1992; Ward 1992), presenting serious problems for interregional dynamics during a specific period (for a trenchant critique, see Weinstein 1996).

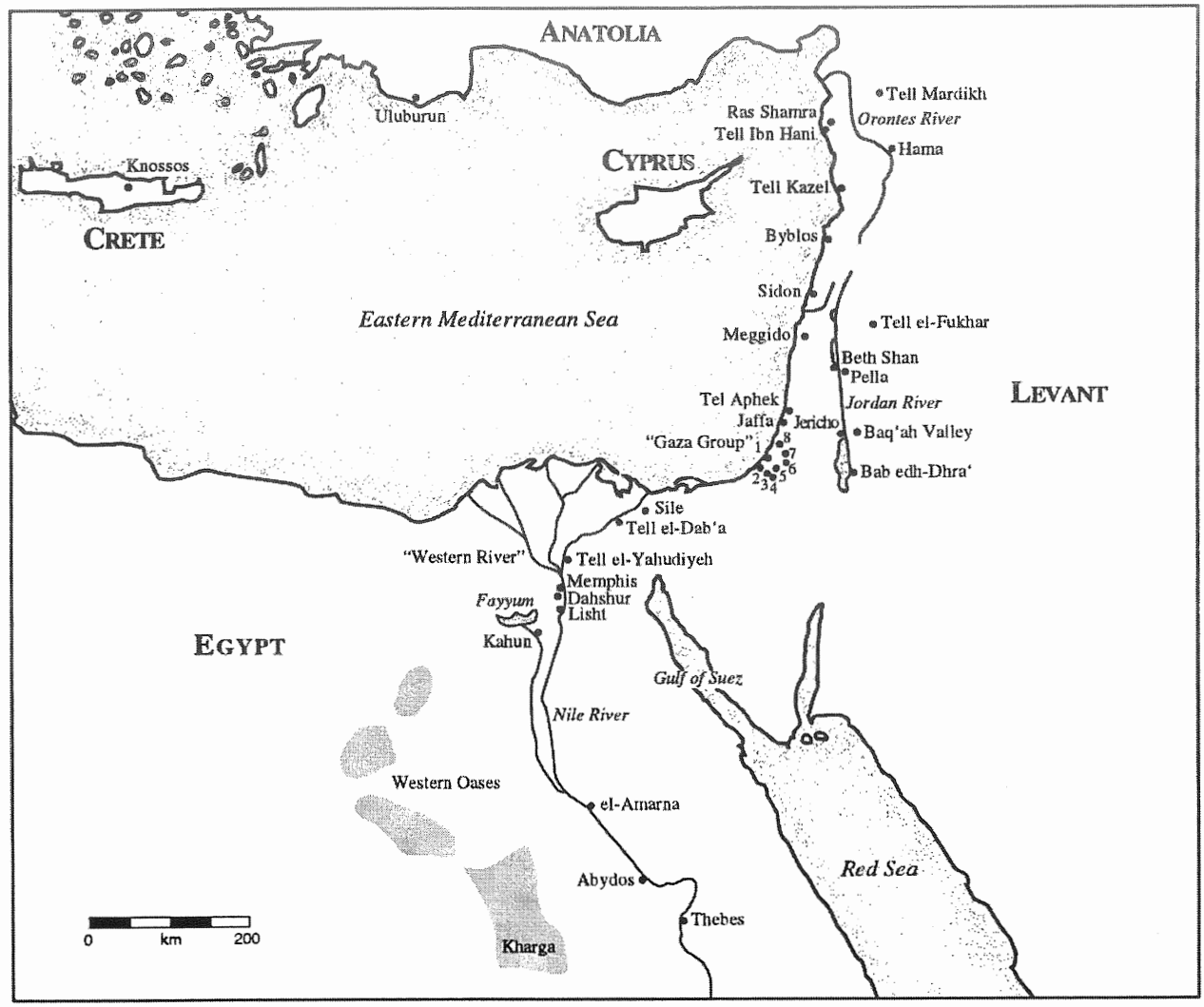


Fig. 1: Eastern Mediterranean, showing Middle Bronze Age sites and regions referred to in the text. The "Gaza group of Middle Bronze Age sites" includes: (1) Gaza; (2) Tell el-`Ajjul; (3) Tell Jemmeh; (4) Tell el-Far`ah South; (5) Tel Haror; (6) Tell Beit Mirsim; (7) Lachish; and (8) Ashkelon.

As will become evident in this study, special note should be taken of the developments in the so-called "Gaza group of Middle Bronze Age sites" along the southern Palestinian coast (Fig. 1). Here, a number of MB city-states were clustered in the vicinity of modern Gaza, along the coastal plain and farther inland in the Shephelah. Besides ancient Gaza itself, which is covered by a modern city and has been excavated only to a limited extent, the group includes Tell el-`Ajjul (identified as Sharuhen, the Hyksos bastion that Ahmose fought and defeated after three years of fighting--see Kempinski 1974), Tell Jemmeh, Tell el-Far`ah South (which has also been identified as Sharuhen), Tel Haror (Tell Abu Hureira), and Ashkelon. Tell Beit Mirsim and Lachish are also included this group, although farther to the north and inland.

Tell el-Dab`a/Avaris shared in the MB urban development. This site, located east of the easternmost Pelusiac branch of the Nile River and lying south of New Kingdom Pi-Ramesses (modern Qantir), was ideally situated for foreign and intra-Egyptian trade. It went from being a relatively small village in the late Middle Kingdom (strata H/d2, ca. 1830 B.C.) to a huge urban complex of temples, palaces, cemeteries, and residences by the Hyksos period proper (strata E1/second half of b1, beginning ca. 1620 B.C.; for an excellent overview of the evidence then current, see Bietak 1986; more recently, see 1991a-c, 1994, and 1996). The expansion of Tell el-Dab`a to become one of the largest city-states in the Eastern Mediterranean during the later MBA, encompassing an approximately 2.5 km^2 area with a high density of settlement, points to a concomitant growth in population. This demographic increase has been variously explained: whether as the result of native Egyptians and/or descendents of Semitic servants who worked in Middle Kingdom Egypt (Van Seters 1966) settling at Tell el-Dab`a, or whether due to the infusion of new peoples from Syria-Palestine, in accord with the Manethoan tradition and as implied in the second Kamose stela (above). As this NAA study minimally shows, however, intensive trade connections with MB city-states elsewhere in the Eastern Mediterranean was crucial to the economic and social development of the site.

It is likely that the earliest MB IIA levels at Tell el-Dab`a post-date the earliest MB IIA settlements along the Levantine coast. The Canaanite Jars from the earliest MB levels at Tel Aphek/Antipatris (Beck 1975: fig. 1:16, 1985: 186-87, fig. 2:12-15), for example, do not have pronounced exterior ridges below the rims. The ridged variety of the Canaanite Jar, together with other pottery types (such as highly Polished and slipped jugs and juglets), appear later in the Eastern Mediterranean MB IIA sequence. The earliest Canaanite Jars at Tell el-Dab`a are almost exclusively of the ridged variety, the several exceptions in the NAA corpus including a rim that is flattened on top and tapered (JH067), and another tapered rim form that is turned back on itself toward the sidewall of the vessel (JH122). Moreover, the amphoras are found together with highly Polished vessels, as well as other types that become more prevalent in mid-late MB IIA. It might be argued that these stylistic differences are the result of regional rather than chronological factors. But, as will be seen from the NAA results, the most parsimonious and therefore most probable explanation of the differences is that Tell el-Dab`a was occupied at a somewhat later date in MB IIA (i.e., ca. 1830 B.C., according to Bietak's low chronology), than Tel Aphek and other coastal sites (e.g., Tel Ifshar, personal communication from S. M. Paley).

2. Stratigraphy and Pottery Sampling

Two major areas of excavation, AII and FI, yielded the pottery that are the focus of the NAA study. Already in stratum d2 of mid-MB IIA date, Area FI was dominated by houses of Levantine "Mittelsaal" and "Breitraum" types, together with vaulted mudbrick tombs accompanied by typical Levantine burial assemblages and equid sacrifices (see Bietak 1986, 1991a, 1994, and 1996, for general discussion and references). In stratum d1, a large double palace complex of Egyptian type replaced the smaller buildings of d2, with gardens and a continuation of the cemetery, along similar constructional and burial traditions as in the preceding phase, to its south. In Area AII, the beginning of a settlement in stratum H with a predominant Egyptian cultural character combined with Levantine elements was sparse, perhaps only representing the foundations of animal enclosures. In stratum G4, building complexes, sometimes with curved walls and probably combining Levantine and Egyptian architectural traditions, were evidently domestic quarters, storerooms, and enclosures (see, in particular, Bietak 1991b and 1991c). One may contrast the upper class palace in FI with the middle and lower class structures in AII.

A more egalitarian social structure is revealed in the architecture and artifacts of the later MB IIA in both areas FI (stratum c) and AII (stratum G1-3). Small building complexes with curved walls are found in both areas now, and the so-called "villa" house makes its appearance. The latter residence of Egyptian-type has tripartite central quarters, a bedroom, vestibule, and other attached rooms. The relative percentage of Syro-Palestinian-type pottery in this phase (approximately 40% of the entire corpus, compared with 20% of that in the mid-MB IIA phase) suggests an influx of Caaanites from the Levant (Bietak 1991: 38, 1994: 40-41, and 1996: 31-35). Numerous shallow pit graves had been dug into the upper part of this stratum. Multiple burials, with no particular body orientation and few accompanying artifacts, point to some kind of disaster, possibly an epidemic, in which relatively little care was or could be taken in burying the dead.

This calamity was evidently not of large proportions, because settlement in Area FII, at least, continued essentially as it was before into early MB IIB (stratum b3). "Villas" now appear on a grander scale, surrounded by outbuildings and more poorly made residences. For the next two phases of MB IIB (strata b2 and the first half of b1), the architectural layout is hardly altered at all. Following a hiatus of settlement in Area AII, however, the first of a series of temples appears (Temple III) in stratum F, possibly built by king Nahesy. Its straight-through tripartite layout, with a niche in the back wall, is closely comparable to a standard Syria-Palestinian temple type, which is especially well-represented in the MBA and early Late Bronze Age (LBA; Wright 1971 and 1985: I:241; Ottosson 1980: 51). A rectangular mudbrick altar for animal sacrifices in front of the temple is a Levantine feature, rarely found in Egyptian temples (cf. Černý 1955: 44-51). In the succeeding strata E3 and E2, more temples are built, including a "Breitraum" Syro-Palestinian type (Temple II) and the standard Egyptian type with three side-by-side sanctuaries and an "offering table room" in front (Temples I and V). Vaulted mudbrick chamber tombs in both areas continue to be richly supplied with Levantine metal weapons and other burial goods. Syro-Palestinian-type pottery remains at the 40% level for the corpus as a whole.

A standard Egyptian-style temple was probably built over the "villas" of later MB IIB (second half of strata b1-a2) in Area FII, but modern plowing has destroyed everything after this period. Temples I, III, and V were refurbished in Area AII in E1. The most notable development of this phase and the succeeding one (stratum D3), however, is the tremendous expansion of the site over a 2.5 km^2 area with a high density of settlement, as pointed out above and probably marking the beginning of the "Hyksos" city-state proper.

The final MB IIC phase of the "Hyksos" capital of Avaris is represented by stratum D2 in Area AII, which has tightly built up houses, with two rooms in the back and two in the front, in the vicinity of Temple III. Syro-Palestinian pottery types have decreased somewhat (about 30% of the corpus), and, as the NAA study shows most of the vessels, even those inspired by Levantine prototypes, are actually made of Nile alluvial clay. Housing and burial types are more Egyptianized than in any previous period. No destruction layer was observed above the MB IIC phase in any area of the excavation, in seeming contradiction to the statement in the second Kamose stela that the "Hyksos" citadel was destroyed.

TABLE 1
CONTEXTUAL ANALYSIS OF MAJOR MIDDLE BRONZE AGE POTTERY CLASSES AT TELL EL-DABA

	BURIAL	JAR BURIAL	OFFERING	PALACE	TEMPLE	DOMESTIC	?
AMPHORAS							
MB IIA	18	6	0	18	0	35	0
MB IIA-B	11	5	8	0	1	38	0
MB IIB	9	13	2	0	0	40	0
MB IIB-C	4	10	3	0	0	17	0
MB IIC	0	3	0	0	0	10	0
Later or ?	1	1	0	0	0	5	4
POLISHED							
MB IIA	13	0	1	2	0	10	0
MB IIA-B	48	0	0	0	0	5	0
MB IIB	54	0	0	0	0	8	0
MB IIB-C	4	0	0	0	0	0	1
MB IIC	2	0	0	0	0	2	0
?	1	0	0	0	0	0	1
PAINTED							
MB IIA	0	1	1	5	1	15	1
MB IIA-B	0	0	2	0	1	3	1
MB IIB	6	0	0	0	0	6	0
MB IIB-C	4	0	0	0	0	3	0
?	0	0	0	0	0	4	0
YAHUDIYEH							
MB IIA	2	0	0	1	0	6	0
MB IIA-B	5	0	0	0	0	1	0
MB IIB	9	0	0	0	0	3	0
MB IIB-C	8	0	0	0	0	0	0
?	0	0	0	0	0	3	0
MISCELL.							
MB IIA	0	0	0	1	0	9	12
MB IIA-B	1	0	0	0	0	6	2
MB IIB	3	0	0	0	0	6	7
MB IIB-C	2	0	0	0	0	0	0
MB IIC	4	0	0	0	0	3	2
?	0	0	0	0	0	1	0

MISCELL. = Miscellaneous types, including Egyptian and Levantine

In approaching such a rich and varied site as Tell el-Dab`a, one must decide upon a sampling strategy. In general, a range of Syro-Palestinian types--Canaanite Jars, Polished jugs, juglets and bowls, Tell el-Yahudiyeh juglets, and Levantine Painted Ware--which were considered sufficiently representative of the whole corpus, period by period, were chosen by director of the excavation, Dr. Manfred Bietak, with some input from Mrs. Joan Huntoon and this writer. More emphasis was placed on the mid-late MB IIA groups and special ware types (e.g., whitish and grayish colored fabrics thought to be of Syrian or Lebanese origin), in order to resolve the issue of the origins and early development and trading relations of the settlement at Tell el-Dab`a. To a much more limited extent, Egyptian-style vessels and imports from elsewhere in the Mediterranean (e.g., MB IIA Kamares ware and Cypriot pottery, which becomes especially popular in MB IIC at Tell el-Dab`a) were sampled, to establish a baseline for local production and importation over a wider geographic area. In addition, clays were collected from an MB IIC pit in Area AII, used in preparing clay in antiquity, and from a nearby modern pottery-manufacturing installation at Faqus.

Since the detailed, up-to-date stratigraphic evidence from some areas and the local Egyptian pottery typological sequence, now being prepared by D. Aston, are still to be published, one might legitimately question the integrity of certain loci and whether undue reliance has been placed upon burial deposits. M. Bietak has categorized the NAA pottery samples by context (burial, jar burial for an infant, offering deposit in the entrance foyer of a burial chamber, palace [Area FI only], temple [Area AII only], residence, and questionable). The results are tabulated in Table 1, as well as being indicated after the area and locus listing in Appendix 1. It can be seen from this table that the sampling covers all the major contexts, vessel classes, and periods very adequately. One might expect a larger percentage of Canaanite Jars from domestic contexts, although MB IIA is over-represented (see above). Polished and Tell el-Yahudiyeh vessels, on the other hand, are overwhelmingly predominant in burials and especially common in MB IIA-B and IIB. Painted pottery types are rather evenly spread across contexts and periods. In a number of instances, multiple examples of the same pottery class were selected for analysis from the same locus, in hopes of shedding light on the buying proclivities or even the ethnic affiliation of a buried individual (burial context) or his/her household (palace or domestic context). The following loci by period and context are especially noteworthy:

MB IIA

Burial (FI j/22, pl. 3, gr. 29): 13 Canaanite Jars from Southern Palestine, 1 Canaanite Jar of questionable provenience but most similar to the Southern Palestine group, and 1 Levantine Painted Ware jar/jug of Egyptian Nile alluvial clay.

Residence (AII n/15, pl. 4, magazine): 4 Canaanite Jars from Southern Palestine, 1 Canaanite Jar of questionable

provenience, and 1 Polished jug from Southern Palestine.

Palace (FI, l/20, pl. 2-3, filling in pit 40, west balk): 1 Canaanite Jar from Tell `Arqa in northern Lebanon, 7 Canaanite Jars of questionable provenience but 1 most similar to the Tell/Mardikh/Ebla and Southern Palestine groups and 1 most similar to the Kamid el-Loz local group of the Biqa`a Valley of Lebanon, and 2 Flat-bottomed Cooking Pots of Egyptian Nile alluvial clay.

MB IIA-B

Burial (AII, l/11, pl. 4, gr. 2:) 1 Canaanite Jar of questionable provenience, 2 Polished jugs/juglets from Southern Palestine, 1 Polished juglet of questionable provenience but most similar to the Southern Palestine group, and 1 Polished juglet of questionable provenience.

Burial (AII, m/10, gr. 8): 4 Polished juglets of Egyptian Nile alluvial clay.

Residence (FI, k/24, pl. 2): 10 Canaanite Jars from Southern Palestine.

MB IIB

Burial (AII, l/12, gr. 3): 4 Polished miniature juglets and 1 dipper juglet from Southern Palestine, 1 Polished miniature juglet of questionable provenience but most similar to the Southern Palestine group, and 1 Polished miniature juglet of questionable provenience.

Burial (AII, m/12, gr. 9): 9 Polished juglets, including miniature, piriform and dipper varieties, of Egyptian Nile alluvial clay and 1 Canaanite Jar from Southern Palestine.

Burial (FI, k/21s, gr. 24): 4 Polished juglets of Egyptian Nile alluvial clay, 1 Polished juglet of questionable provenience but most similar to the Southern Palestine group, 1 Polished juglet of questionable provenience but most similar to Egyptian Nile alluvial clay, 1 Polished juglet of questionable provenience, and 2 cups of Egyptian Nile alluvial clay.

Offering deposit in burial chamber entrance (FI, l/20, gr. 20): 3 Canaanite Jars from Southern Palestine, 1 Canaanite Jar of questionable provenience but most similar to the Tell Mardikh/Ebla group, and 1 Canaanite Jar of questionable provenience but most similar to the Southern Palestine group.

Residence (AII, n/19, pl. 2-3): 1 Canaanite Jar from Southern Palestine, 1 Canaanite Jar of Egyptian Nile alluvial clay, 1 zoomorphic (bird?) figurine fragment of Egyptian Nile alluvial clay, and 1 Levantine Painted Ware jar/jug of questionable provenience.

The association of pottery vessels in a given context, whose origins based on NAA will be more fully explained below and in the chapters that follow, is suggestive of intensive trade and/or ethnic affiliations of families or larger social groups. For example, the pottery from the MB IIA palace context in FII, l/20, pl. 2-3 (filling in pit 40, west balk) comes primarily from inland and coastal regions of Syria and Lebanon, and possibly coastal Palestine. The most plausible scenario is that the imported pottery represents trade with the latter regions. Yet, the presence of a typical Syro-Palestinian cooking pot type, even though made locally, points to a population that most likely originated from the Levant (see Chapter 6, for the highly conservative character of cooking pots and cuisine). This group of pottery from the MB IIA palace is the exception rather than the rule, and other MB IIA and later assemblages, in particular, usually contain an admixture of pottery types that originated either exclusively in Southern Palestine (only Syro-Palestinian types) or were made locally. In Chapter 6, a strong case is made that such distributions represent directed trade and/or ethnic ties. At Tell el-Dab`a, Syro-Palestinian and Egyptian pottery workshops also appear to have been independent of one another throughout the MBA.

3. Analytical and Statistical Approach

The physico-chemical method of NAA has been extensively employed in pottery provenience studies, because of its sensitivity and precision in measuring as many as 35 elements, including rare earths which often characterize a clay source, and because it requires very small samples (50-200 mg) that are non-destructively analyzed. The chemical composition of the 608 pottery and clay samples from the Hyksos capital of Tell el-Dab`a/Avaris, reported on here, were determined at Brookhaven National Laboratory (JH- and MB-series) and the University of Missouri Research Reactor (PMG-series).

The analytical procedures have been fully described elsewhere (Abascal, et al 1974; Bishop, et al. 1982; Glascock 1992). Briefly, samples were prepared either by drilling with a tungsten-carbide drill or by scraping the surface with a sapphire tool until the interior fabric was exposed and crushing to a fine powder using an agate mortar and pestle. Samples were homogenized, oven-dried, and subjected to short and long irradiations. The resultant gamma ray data were then processed, incorporating decay corrections, spectrum analyses and standards, yielding concentrations of elements for each specimen. Following Brookhaven convention, concentrations are reported as oxides of the elements in the order shown in the tables of Appendix 3. Missouri elemental data were converted to the oxides and intercalibrated with the Brookhaven data by multiplying by the relevant factors using a FoxPro database program on an IBM-PC in the Museum Applied Science Center for Archaeology (MASCA) at the University of Pennsylvania Museum.

The Old World databank on the MASCA computer altogether comprises 5716 samples, most of which were analyzed at Brookhaven. The databank has excellent temporal and spatial coverage of many regions of the Near

East and Mediterranean, including Egypt, the Sudan, Greece, Cyprus, Israel and the West Bank, Jordan, Lebanon, Syria, Iraq, Iran, and parts of Turkey. Of most relevance to this study are Levantine and Egyptian pottery and clay groups belonging to the MBA. Mrs. Joan Huntoon was instrumental in collecting many of these samples and shepherding them through analysis at Brookhaven.

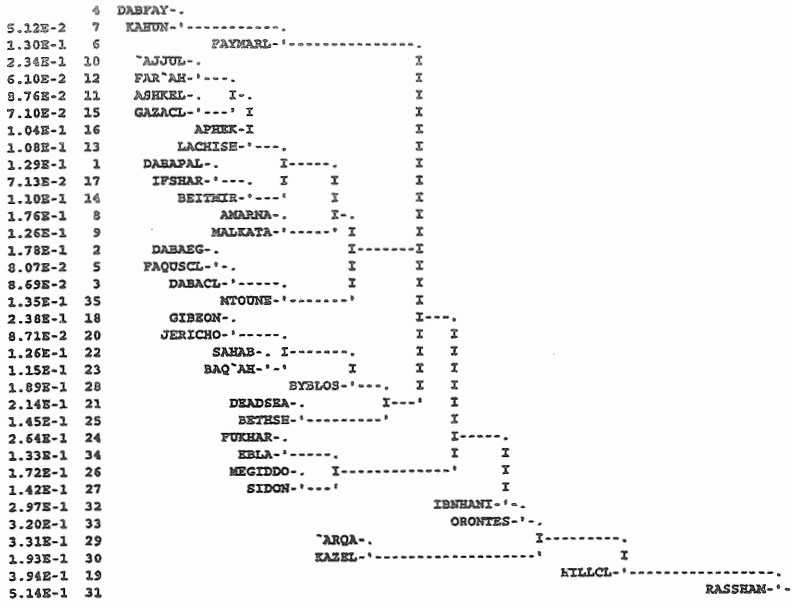
Relating the chemical composition of a particular ancient pottery sample to a given clay source, thereby "fingerprinting" the pottery and its presumed place of manufacture, is based on what has become known as the Provenience Postulate (Weigand, et al. 1977: 15-34) in which it is assumed that the chemical variation within a given clay source is less than that between different sources. The inclusions in the Tell el-Dab`a pottery, whether deriving from the original clay or added as temper by the potter, are relatively "pure" (e.g., quartz, calcite, and organic materials) and have a diluent effect on the chemical composition of an ancient sample that is spread across the range of elements.
A range of univariate and multivariate algorithms--means and standard deviations, and correlational, clustering, and principal components analysis of a range of elements--are used to define local chemical groups of ancient pottery (see Table 2), with widely divergent samples (outliers) being excluded. Archaeological and geological criteria are also important in refining and testing these groups, whether well-dated pottery types, clays from specific geochemical regimes, clay beds within a single deposit, etc. This approach is essential when an ancient clay source has been totally exploited or systematic clay sampling has not yet been carried out in a region. Unless otherwise states, the geographic extent of a local group is assumed to apply to a clay source exploited in the vicinity of the site, possibly as far as 5-10 km away. The geographic extent is important in assessing whether a particular workshop, group of workshops, or larger economic unit is involved.

It is quite common for the elements in clays and minerals to covary with one another. For example, the high correlation ($r>0.99$) of iron and scandium, both trivalent ions of about equal size, in nature is well known. Univariate statistics can be very misleading if such relationships go unrecognized (see Brooks, et al. 1974: 56-57).

If the variance-covariance matrix for many elements of a presumed local group is calculated, a new set of standardized orthogonal coordinates (eigenvectors) can be defined in multidimensional Mahalanobis space that takes advantage of elemental correlations (Harbottle 1991: 413-24; also see Leese and Main 1994, Baxter 1994, and especially Beier and Mommsen 1994 for a particularly powerful approach in which dilution effects are automatically taken into account and normalization of the data is unnecessary). For the statistical calculations here, the oxide data are converted to logarithms, since many chemical elements appear to be lognormally distributed in nature, and are also standardized by this procedure. The Mahalanobis distance of a given sample from the origin or centroid of the group is directly related to the probability of the group membership of that sample, assuming a multivariate normal distribution (Sayre 1975). Using fifteen elements in the calculation--sodium (Na), potassium (K), cesium (Cs), rubidium (Rb), barium (Ba), scandium (Sc), europium (Eu), thorium (Th), hafnium (Hf), manganese (Mn), cobalt (Co), chromium (Cr), iron (Fe), samarium (Sm), and ytterbium (Yb), as the oxides--it has been estimated by comparisons of the large Brookhaven New World pottery data bank (about 10,000 samples) against the Old World data bank (about 5000 samples) that the accidental assignment of a sample at a Mahalanobis distance probability (MDP) of 1% is nil for these two archaeologically and geochemically distinct regions (Harbottle 1991). Within a more circumscribed region, such as Egypt and the Eastern Mediterranean, where the same or related geological processes have been at work (see Said 1962, 1981, and 1990), this unique chemical "fingerprinting" is not assured. But with high correlations between many elements, such as is characteristic of Levantine clays and pottery, it is possible to achieve extremely good results. A MDP above 5% for a sample tested against a group with a high sample number to variate ratio is a strong guarantee that it belongs to that group. In principle, only the Tell el-Dab`a and Southern Palestinian groups were large enough to assure meaningful MDP results (below).

Using the set of GAUSS programs that have been developed by H. Neff (1994), principal component bivariate plots, based on variance-covariance or correlation matrices and RQ factor analysis, can be conveniently inspected for coherence of groups and any outliers (see Figs. 3-21). Another useful GAUSS program that was used to screen samples for local groups was Mahalanobis distance posterior classification in which the sample was either included or not included ("jackknifed") in the proposed group, the results being compared and a judgment made about whether to retain the sample in the group.

With small groups that are not amenable to MDP evaluation, other less powerful statistical techniques can be used. The nearness of samples in mean Euclidean distance (MED) space (defined as the square root of the mean of the sum of the squares of the differences between the log elemental concentrations of any given pair of samples), especially if the standard deviation for many elements is small (5-15%), is a good indicator that the samples belong to the same clay group. Although correlational effects are excluded from this calculation, excellent results were obtained with the fifteen elements used--Na, K, Cs, Rb, Ba, Sc, Eu, Th, Hf, Mn, Co, Cr, Fe, Sm, and Yb, as the oxides--because the variance in the MED approaches zero as the inverse of the number of variables (Harbottle 1991). An MED of less than 0.08 has been empirically determined to be indicative of group membership and a chemical "match." MED relationships, as well as the determination of outliers, can be graphically represented as dendrograms (see Fig. 2), generated by hierarchical aggregative


4 DABFAY-.
5.12E-2 7 KABUN-'-----.
1.30E-1 6 PAYMARL-'----------.
2.34E-1 10 `AJJUL-. I
6.10E-2 12 FAR`AH-'---. I
8.76E-2 11 ASHKEL-. I-. I
7.10E-2 15 GAZACL-'---' I I
1.04E-1 16 APHEK-I I
1.08E-1 13 LACHISE-'---. I
1.29E-1 1 DABAPAL-. I-----. I
7.13E-2 17 IFSHAR-'---. I I I
1.10E-1 14 BEITHIR-'---' I I
1.76E-1 8 AMARNA-. I-. I
1.26E-1 9 MALKATA-'-----' I I
1.78E-1 2 DABAEG-. I-------I
8.07E-2 5 FAQUSCL-'-. I I
8.69E-2 3 DABACL-'-----. I I
1.35E-1 35 NTOUNE-'-------' I
2.38E-1 18 GIBEON-. I---.
8.71E-2 20 JERICHO-'-----. I I
1.26E-1 22 SAHAB-. I-------. I I
1.15E-1 23 BAQ`AH-'-' I I I
1.89E-1 28 BYBLOS-'---. I I
2.14E-1 21 DEADSEA-. I---' I
1.45E-1 25 BETHSE-'---------' I
2.64E-1 24 FUKHAR-. I-----.
1.33E-1 34 EBLA-'-----. I I
1.72E-1 26 MEGIDDO-. I----------' I
1.42E-1 27 SIDON-'---' I
2.97E-1 32 IBNHANI-'-.
3.20E-1 33 ORONTES-'-.
3.31E-1 29 `ARQA-. I---------.
1.93E-1 30 KAZEL-'----------' I
3.94E-1 19 KILLCL-'----------.
5.14E-1 31 RASSHAN-'-

[1]E-1 and E-2 indicate that the entry should be multiplied by 0.1 or 0.01, respectively. The first left-hand column gives the mean Euclidean distance to a node on the dendrogram, which is displaced horizontally in direct proportion to the mean Euclidean distance. The second left-hand column gives the order of hierarchical cluster formation, which is not always the same as a nearest neighbor ordering in mean Euclidean space (see Table 3 and text). For abbreviated group names, see text.

Fig. 2 Dendogram of analyzed Levantine and Egyptian local groups[1]

clustering algorithms. Because of the inherent limitations of a two-dimensional projection of points in multidimensional space, it is important to confirm the "results" from a dendrogram by examining the actual distance matrix on which the latter is based (see Table 3). If a range of pottery types of presumed local manufacture have been tested, a local origin may be proposed for the group.

More than twice as many elements than the fifteen used in the statistical evaluation presented here are routinely measured at MURR. Fewer elements were measured at Brookhaven when NAA was first being developed as a tool of pottery provenience studies. Where data are missing for some Brookhaven samples (viz., arsenic [As], antimony [Sb], lanthanum [La], nickel [Ni], strontium [Sr], titanium [Ti], uranium [U], zinc [Zn], and zirconium [Zr]) or an element hadn't been measured (viz., aluminum [Al], cerium [Ce], dysprosium [Dy], neodymium [Nd], tantalum [Ta], terbium [Tb], and vanadium [V]) statistical comparisons would be misleading, and those elements are therefore not used (see Glascock 1992). Moreover, lutetium (Lu) was excluded, because it is highly variable in nature. Some of these elements have been shown to be potentially important for Syria and eastern Turkey (e.g., Ni and V), as well as distinguishing Egyptian clays (e.g., Sr, Ti, and Zr) (G. Schneider and A. Pape, personal communications), so it is unfortunate that they could not be included in the statistical evaluation (note, however, that four of these elements [La, Ce, Lu, and Ta] are reported in the tables in Appendix 3).

Calcium (Ca) is a particularly difficult element to deal with in the statistical evaluation, since the amount present can be due to its presence in the clay and/or aplastics in the clay or as mineral temper intentionally added to the fabric. In the ancient Near East and Egypt, calcareous clays are quite common, and calcium-containing aplastics are generally present as calcium carbonate, which decomposes to calcium oxide and carbon dioxide at firing temperatures exceeding 600°C. In lieu of petrographic details for most of the local groups, correction for calcium dilution of other elements by various mathematical procedures (e.g., Steponaitis and Blackman 1981) was found not to improve the statistical evaluation using the uncorrected data. A best relative fit by the criterion of least squares of sample data, using elements present in clay but not in calcium minerals (e.g., Th, Mn, Fe, and the rare earths), was also tried, yielding relatively poor results. An alternative least-squares fit using Sr, which is often correlated with Ca in nature, was equally uninformative. Distinctive mineral suites for specific local group samples would enable correction factors to be derived that take into account the chemical compositions of specific inclusions (cf. Neff, et al. 1988 and 1992, for volcanic ash and shell tempers). Since it is doubtful, however, that these corrections would significantly improve local group separation in this study (Neff, et al. 1988: 170), such a study is yet to be carried out.

4. Egyptian and Levantine Local Groups

Table 2 presents the mean percentage by weight (%) or parts per million (PPM) of the elemental oxides used in statistically evaluating and establishing each local group (see next section of this chapter for the specific samples included in each group and general archaeological details). Pottery from Tell el-Dab`a, including the large groups of

TABLE 2
NEUTRON ACTIVATION ANALYSES OF SELECTED LEVANTINE AND EGYPTIAN LOCAL GROUPS[1]

Sample Identification	Na_2O (pct)	K_2O (pct)	Rb_2O (ppm)	Cs_2O (ppm)	BaO (ppm)	Sc_2O_3 (ppm)	La_2O_3 (ppm)	CeO_2 (ppm)	Eu_2O_3 (ppm)	Lu_2O_3 (ppm)	HfO_2 (ppm)	ThO_2 (ppm)	Ta_2O_5 (ppm)	Cr_2O_3 (ppm)	MnO (ppm)	Fe_2O_3 (pct)	CoO (ppm)	CaO (pct)	Sm_2O_3 (ppm)	Yb_2O_3 (ppm)
DABAPAL	0.718	1.49	37.0	1.45	649.	18.8	34.2	74.7	1.66	0.560	7.53	7.77	1.65	153.	901.	4.90	21.6	18.3	6.59	3.49
DABAEG	1.710	1.81	44.6	1.21	717.	33.2	34.6	74.0	2.20	0.580	7.69	6.83	2.08	187.	1440.	8.69	41.9	6.0	7.48	3.30
DABACL	2.200	2.08	53.5	1.39	460.	40.5	38.9	68.8	2.45	0.680	7.61	6.96	2.14	217.	1040.	10.50	39.6	1.8	7.17	3.12
FAQUSCL	1.400	2.05	55.5	1.53	482.	40.3	38.7	75.6	2.45	0.670	6.97	6.87	2.21	196.	1950.	10.70	44.8	4.8	7.33	3.21
FAYMARL	2.000	1.28	58.6	3.07	346.	31.6	60.9	112.0	2.83	0.920	10.70	13.40	2.83	178.	177.	7.59	16.3	4.7	10.20	5.06
KAHUN	1.860	1.17	50.1	2.85	266.	29.7	47.5	94.6	2.11	0.568	10.39	11.10	2.39	156.	365.	6.82	24.2	11.1	8.24	3.46
AMARNA	1.140	1.38	41.4	2.31	280.	22.5	31.4	63.9	1.70	0.430	3.68	6.07	1.39	244.	682.	6.12	26.9	23.9	5.93	2.29
THEBES	0.925	1.22	42.5	1.90	331.	24.7	39.5	88.4	1.92	0.600	6.75	8.04	2.00	159.	1240.	6.61	24.6	19.4	7.74	3.11
`AJJUL	0.980	1.64	50.2	1.33	1060.	22.2	36.6	78.4	1.83	0.600	10.20	8.65	1.91	137.	1040.	5.85	26.4	9.3	7.07	4.01
ASHKEL	0.842	1.77	44.8	1.47	531.	20.1	35.3	77.6	1.78	0.600	10.30	8.17	1.68	153.	1070.	5.48	31.3	8.2	6.95	3.43
FAR`AH	1.086	1.47	36.9	1.42	768.	22.5	37.8	81.6	1.91	0.640	11.60	8.99	1.92	150.	1130.	6.03	31.6	10.2	7.40	3.95
LACHISH	0.915	2.07	38.6	1.38	457.	18.6	33.1	72.9	1.71	0.620	14.90	7.95	1.59	124.	881.	4.88	20.7	19.4	7.23	3.82
BEITMIR	0.656	2.31	43.1	2.14	1270.	20.3	30.6	61.8	1.52	0.540	7.19	6.88	1.26	167.	763.	4.81	18.6	19.4	6.15	3.40
GAZACL	1.110	1.44	55.1	1.90	457.	24.0	34.5	85.7	2.00	0.730	11.30	9.28	2.08	173.	1130.	6.54	31.0	9.1	7.65	3.98
APHEK	0.655	1.94	41.7	1.22	843.	21.1	38.6	86.3	1.89	0.710	16.10	8.83	1.82	187.	1490.	5.68	29.1	12.6	7.25	4.63
IFSHAR	0.483	1.53	42.6	1.20	817.	16.9	33.1	68.0	1.59	0.600	8.63	7.76	1.68	148.	1016.	4.49	19.6	19.1	5.34	2.94
GIBEON	0.348	2.84	62.5	2.98	375.	21.4	26.0	61.7	1.37	0.460	7.00	7.34	1.14	115.	546.	4.89	18.4	16.5	5.59	2.34
HILLCL	0.087	3.95	92.2	5.01	117.	25.2	23.6	58.8	1.46	0.500	3.48	7.52	0.94	127.	546.	4.68	15.5	15.2	5.76	2.79
JERICHO	0.609	3.01	56.8	2.41	266.	19.8	31.1	63.3	1.42	0.500	6.48	7.39	1.40	152.	576.	4.47	18.5	21.0	5.80	2.60
DEADSEA	1.170	2.21	37.8	1.69	594.	12.4	27.9	62.4	1.27	0.410	6.22	8.73	1.52	107.	568.	3.55	15.0	18.7	5.14	2.31
SAHAB	0.356	2.72	67.0	4.23	305.	23.6	40.8	79.5	1.67	0.650	5.45	10.24	1.87	248.	404.	4.71	16.5	21.0	6.49	3.55
BAQ`AH	0.308	2.13	72.2	4.07	476.	29.6	30.3	65.2	1.50	0.620	6.13	8.96	1.83	137.	485.	6.23	25.2	9.3	6.66	3.11
FUKHAR	0.498	1.58	36.1	1.72	1560.	22.3	41.7	77.1	1.99	0.900	5.64	7.69	1.47	278.	986.	5.42	24.3	2.4	8.10	4.14
BETHSH	0.564	1.97	32.6	1.51	329.	14.4	23.0	48.8	1.17	0.340	4.65	5.31	1.35	96.	344.	3.85	12.3	33.0	4.56	1.79
MEGIDDO	0.561	1.32	37.9	1.08	2970.	17.6	37.5	62.2	1.57	0.600	5.17	5.57	1.34	199.	895.	4.48	22.5	22.7	6.08	2.49
SIDON	0.252	0.730	49.6	1.53	0.328	18.2	36.3	70.9	1.86	0.631	6.46	7.13	1.00	129.	498.	3.64	15.3	21.0	5.20	2.69
BYBLOS	0.323	0.69	52.2	2.93	279.	19.4	36.1	78.5	1.56	0.520	7.65	9.55	1.38	163.	756.	5.27	28.7	12.6	7.38	2.80
`ARQA	0.195	1.51	97.5	6.59	349.	39.2	71.3	129.0	3.20	0.940	8.56	16.40	2.66	281.	1180.	10.50	48.2	10.6	12.20	5.19
KAZEL	0.241	0.96	59.2	2.41	439.	35.4	55.6	137.0	2.66	0.770	10.30	11.50	3.20	385.	2870.	11.80	69.8	5.8	8.64	4.42
RASSHAM	0.214	0.52	27.6	1.25	2010.	17.2	26.1	47.3	1.18	0.410	1.82	3.08	0.66	3810.	1500.	3.62	29.3	29.5	4.77	2.30
IBNHANI	1.490	2.56	111.0	5.45	629.	32.7	35.5	76.3	1.56	0.530	4.73	11.20	1.41	524.	1630.	7.53	40.5	13.3	6.39	2.78
ORONTES	0.538	3.94	141.0	5.43	1350.	27.2	61.9	142.0	2.66	0.800	8.24	20.80	2.63	175.	318.	7.02	28.1	9.4	12.50	4.01
EBLA	0.292	1.47	36.0	1.83	1068.	19.8	28.3	58.6	1.39	0.400	3.49	6.83	1.37	239.	815.	5.48	28.2	31.5	5.25	2.37
MTOUNE	0.714	2.61	51.7	1.91	712.	26.7	41.2	88.3	2.18	0.560	7.23	8.85	2.52	214.	1550.	8.56	44.0	15.2	7.73	3.41

[1]The compositions of the elemental oxides are cited as weight percentages (pct) or parts per million (ppm).

locally produced and the imported vessels from Southern Palestine (labeled DABAEG and DABAPAL, respectively, in tables and figures) , is listed before the Levantine groups. With several exceptions, the latter are listed from south to north and coastal to inland; thus, the Gaza group of Middle Bronze Age sites (the Southern Palestine group) precedes local groups farther up the coastline (e.g., Tell Ifshar), followed by more inland groups, including several in Transjordan. For Syria, the inland sites are not arranged in a particular geographic order.

A simple visual inspection of the data in Table 2 reveals some interesting, general trends, despite the fact that univariate and quasi-multivariate approaches can be misleading. For example, Nile alluvial clay (labeled

DABAEG, DABACL, and FAQUSCL in tables) can be seen to have elevated levels of Na, Sc, Eu, Mn, and Co, compared to the other groups. By contrast, an Upper Eocene Egyptian marl clay that outcrops as the Qasr el-Sagha formation, north of Lake Qarun in the Fayyum, and probably extends to the eastern bank of the Nile (below), is marked by depressed levels of Mn and Co; yet, Na and Eu, along with a number of other elements (e.g., Hf, Th, Ce, La, and Sm), are present in relatively high amounts. A presumed marl clay at Amarna is lower in Hf, whereas a probable marl clay at Thebes (MALKATA) has more Mn, compared with the Fayyum marl.

It is also instructive to note a gradual increase in transition metals (particularly Cr, Mn, and Co) as one moves from south to north along the Mediterranean coast. The well-defined modern loess clay of the region (GAZACL; see Goren 1995 and 1996), as well as the MBA Gaza group samples of Southern Palestine, have relatively less of these elements than mid-coastal sites (Tel Aphek and Tell Ifshar), which in turn have lower amounts than sites farther up the coastline in Lebanon (Sidon, Byblos, and Tell `Arqa) and in Syria (Tell Kazel, Ras Shamra [RASSHAM] and Tell Ibn Hani). Similar trends, which are more variable, can be detected in the alkalis and alkaline earths, and, to a more limited extent, in the rare earths. These trends are all the more significant, since samples from northern sites are tempered more heavily with calcite which has a diluent effect on the composition.

Moving into inland Palestine (including Transjordan) and Syria, most groups show a decrease in most elements across the board. One might choose to focus on a specific element (e.g., lower Ta in the limestone-derived clay of the Moza Formation in central Hill Country of Palestine, or the very low amounts of Mn in samples from Beth Shan in the eastern Jezreel Valley and sites along the upper to middle Orontes River). Yet, establishing provenience on the basis of a single element is precarious, especially in the Eastern Mediterranean region where incursions of the Mediterranean (Tethys Sea) have contributed to similar geochemical regimes. Thus, a very low value of Ta is seen in the Ras Shamra group, and a coastal site (Sidon), as well as Egyptian marl groups (FAYMARL and KAHUN), have relatively low contents of Mn.

A quasi-multivariate approach that provides somewhat better definition of local group is to examine bivariate plots and ratios. Particularly sensitive ratios (Th/Hf and Sc/Fe) have already been mentioned above, and scatterplots, which are still valid for the Eastern Mediterranean region according to our expanded database, are published in Brooks, et al. 1974, as figures 3 and 4. For example, the Th/Hf ratio for the red loess clay and the MBA Southern Palestine group has an average of 0.79 (range of 0.53 to 0.96; compare the 0.74 average in Brooks, et al. 1974), which is comparable to the imported group at Tell el-Dab`a with a value of 1.03, but much lower than the Th/Hf ratios of coastal and inland Syria (2.03 and 2.24, respectively) and the Hill Country of central Palestine (1.6). Yet, any inferences about proveniences based solely on this criterion would be extremely misleading, because other regions (e.g., mid-coastal Palestine, with an average of 0.73, and the Nile alluvial groups, with an average of 0.9), have similar ratios. Likewise, Mediterranean coastal groups in the south and as far north as Tell `Arqa in southern Syria have lower Sc/Fe averages (ranging from an average of 3.6 to 3.82) than the north Syrian coastal groups (average of 4.55) or inland Transjordan (average of 4.34), but the Nile alluvial groups have a nearly identical range of averages (3.77 to 3.86).

As discussed above, hierarchical aggregative clustering, in which coefficients of similarity are calculated between samples in multidimensional Euclidean space, can provide a convenient and useful two-dimensional representation of groupings. Many of the groupings which have been confirmed using more powerful statistical techniques (below) are apparent on the dendrogram (Fig. 2). The Egyptian marl clay groups, including samples made from Fayyum-Maadi marl clay imported to Tell el-Dab`a (labeled DABFAY on the dendrogram), cluster together at the top. The Southern Palestine group samples, the local red loess clay, and the imported group of pottery from this region found at Tell el-Dab`a cluster together next on the dendrogram. The chemical similarity of one mid-coastal group (Tel Ifshar) is evident from its inclusion in this grouping. Marl clays from Upper Egypt (el-Amarna and Thebes [MALKATA]) follow. The Nile alluvial clay groups are close to one another, as are the central Palestinian, Jordan Valley, and Transjordanian groups. The apparent groupings that follow are quite far removed from one another in Euclidean space, and are not substantiated by more powerful statistical techniques.

The dendrogram "results" are supported by the MED matrix (Table 3). The closeness of the Tel Ifshar group to the imported group at Tell el-Dab`a is intriguing, suggesting that it might be viewed as a distant member of the Gaza group of sites from where the Dab`a imports originate. If the mean Euclidean distance between any two samples exceeds 0.09, as in all the samples following JERICHO, no firm conclusions can be drawn. Yet, some correlations between sites in the same geographical region (e.g., SAHAB and BAQ`AH) are probably significant, even when their mean Euclidean distance difference exceeds 0.1.

TABLE 3
DISTANCE MATRICES OF ANALYZED LEVANTINE AND EGYPTIAN LOCAL GROUPS
BY DECREASING ORDER OF MEAN EUCLIDEAN DISTANCE[1]

DABAPAL	IFSHAR	7.13E-2	ASHKEL	7.31E-2	`AJJUL	9.49E-2	FAR`AH	9.57E-2	LACHISH	1.02E-1	BEITMIR	1.08E-1	MALKATA	1.13E-1
	GAZACL	1.21E-1	APHEK	1.28E-1	DEADSEA	1.39E-1	FUKHAR	1.39E-1	MTOUNE	1.58E-1	JERICHO	1.64E-1	EBLA	1.68E-1
	DABAEG	1.71E-1	AMARNA	1.72E-1	GIBEON	1.82E-1	BYBLOS	1.88E-1	DABFAY	1.91E-1	MEGIDDO	1.92E-1	BAQ`AH	2.01E-1
	BETHSH	2.03E-1	KAHUN	2.04E-1	FAQUSCL	2.06E-1	DABACL	2.09E-1	SAHAB	2.27E-1	SIDON	2.51E-1	FAYMARL	2.86E-1
	IBNHANI	2.96E-1	KAZEL	3.04E-1	ORONTES	3.20E-1	`ARQA	3.38E-1	HILLCL	3.87E-1	RASSHAM	4.76E-1		
DABAEG	FAQUSCL	8.07E-2	DABACL	8.36E-2	FAR`AH	1.17E-1	MTOUNE	1.27E-1	GAZACL	1.29E-1	`AJJUL	1.35E-1	ASHKEL	1.36E-1
	MALKATA	1.52E-1	APHEK	1.67E-1	DABAPAL	1.71E-1	LACHISH	1.87E-1	AMARNA	2.08E-1	FUKHAR	2.09E-1	BEITMIR	2.09E-1
	DABFAY	2.09E-1	IFSHAR	2.11E-1	KAHUN	2.14E-1	IBNHANI	2.51E-1	DEADSEA	2.52E-1	MEGIDDO	2.58E-1	JERICHO	2.62E-1
	EBLA	2.66E-1	BAQ`AH	2.92E-1	BYBLOS	2.92E-1	KAZEL	2.94E-1	GIBEON	2.95E-1	FAYMARL	3.14E-1	SAHAB	3.28E-1
	BETHSH	3.30E-1	SIDON	3.41E-1	ORONTES	3.55E-1	`ARQA	3.62E-1	HILLCL	4.86E-1	RASSHAM	5.14E-1		
DABACL	DABAEG	8.36E-2	FAQUSCL	9.02E-2	GAZACL	1.45E-1	MTOUNE	1.62E-1	MALKATA	1.63E-1	FAR`AH	1.67E-1	ASHKEL	1.71E-1
	DABFAY	1.76E-1	KAHUN	1.80E-1	`AJJUL	1.87E-1	AMARNA	1.93E-1	LACHISH	2.09E-1	DABAPAL	2.09E-1	APHEK	2.19E-1
	IBNHANI	2.38E-1	BEITMIR	2.46E-1	JERICHO	2.53E-1	IFSHAR	2.56E-1	FUKHAR	2.58E-1	DEADSEA	2.69E-1	FAYMARL	2.75E-1
	BAQ`AH	2.93E-1	GIBEON	2.97E-1	BYBLOS	3.04E-1	EBLA	3.04E-1	SAHAB	3.15E-1	MEGIDDO	3.17E-1	KAZEL	3.18E-1
	BETHSH	3.35E-1	ORONTES	3.51E-1	`ARQA	3.60E-1	SIDON	3.95E-1	HILLCL	4.77E-1	RASSHAM	5.47E-1		
DABFAY	KAHUN	5.12E-2	FAYMARL	1.22E-1	GAZACL	1.48E-1	MALKATA	1.66E-1	DABACL	1.76E-1	LACHISH	1.76E-1	ASHKEL	1.77E-1
	AMARNA	1.82E-1	FAR`AH	1.84E-1	DABAPAL	1.91E-1	JERICHO	1.94E-1	`AJJUL	1.99E-1	DABAEG	2.09E-1	DEADSEA	2.14E-1
	BAQ`AH	2.24E-1	BEITMIR	2.28E-1	FAQUSCL	2.29E-1	SAHAB	2.31E-1	MTOUNE	2.32E-1	GIBEON	2.33E-1	BYBLOS	2.38E-1
	APHEK	2.43E-1	IFSHAR	2.44E-1	BETHSH	2.64E-1	FUKHAR	2.69E-1	ORONTES	2.87E-1	IBNHANI	2.89E-1	EBLA	3.03E-1
	MEGIDDO	3.34E-1	`ARQA	3.38E-1	KAZEL	3.62E-1	SIDON	3.74E-1	HILLCL	4.19E-1	RASSHAM	5.83E-1		
FAQUSCL	DABAEG	8.07E-2	DABACL	9.02E-2	MTOUNE	1.17E-1	GAZACL	1.42E-1	MALKATA	1.52E-1	ASHKEL	1.63E-1	FAR`AH	1.65E-1
	`AJJUL	1.84E-1	APHEK	1.97E-1	DABAPAL	2.06E-1	AMARNA	2.11E-1	LACHISH	2.17E-1	IBNHANI	2.25E-1	KAHUN	2.28E-1
	DABFAY	2.29E-1	FUKHAR	2.42E-1	IFSHAR	2.43E-1	BEITMIR	2.45E-1	KAZEL	2.58E-1	JERICHO	2.61E-1	EBLA	2.83E-1
	BAQ`AH	2.85E-1	BYBLOS	2.88E-1	DEADSEA	2.90E-1	GIBEON	2.92E-1	MEGIDDO	3.08E-1	SAHAB	3.19E-1	`ARQA	3.23E-1
	FAYMARL	3.34E-1	BETHSH	3.53E-1	ORONTES	3.60E-1	SIDON	3.81E-1	HILLCL	4.56E-1	RASSHAM	5.28E-1		
FAYMARL	DABFAY	1.22E-1	KAHUN	1.38E-1	GAZACL	2.51E-1	LACHISH	2.70E-1	MALKATA	2.70E-1	AMARNA	2.71E-1	SAHAB	2.73E-1
	DABACL	2.75E-1	JERICHO	2.76E-1	FAR`AH	2.84E-1	ASHKEL	2.84E-1	DABAPAL	2.86E-1	BAQ`AH	2.88E-1	DEADSEA	2.90E-1
	`AJJUL	2.91E-1	ORONTES	2.96E-1	BEITMIR	3.06E-1	GIBEON	3.08E-1	BYBLOS	3.10E-1	DABAEG	3.14E-1	BETHSH	3.30E-1
	MTOUNE	3.31E-1	FAQUSCL	3.34E-1	APHEK	3.35E-1	IFSHAR	3.36E-1	FUKHAR	3.42E-1	IBNHANI	3.58E-1	`ARQA	3.81E-1
	EBLA	3.85E-1	MEGIDDO	4.09E-1	SIDON	4.29E-1	KAZEL	4.40E-1	HILLCL	4.64E-1	RASSHAM	6.42E-1		
KAHUN	DABFAY	5.12E-2	FAYMARL	1.38E-1	GAZACL	1.45E-1	MALKATA	1.57E-1	AMARNA	1.78E-1	DABACL	1.80E-1	ASHKEL	1.85E-1

[1] E-1 and E-2 indicate that the entry should be multiplied by 0.1 or 0.01, respectively. For abbreviated local group names, see text. Mean Euclidean distances run in decreasing order from left to right in each row, going from top to bottom.

TABLE 3–contnued
DISTANCE MATRICES

	LACHISH	1.87E-1	FAR`AH	1.91E-1	DABAPAL	2.04E-1	JERICHO	2.08E-1	DABAEG	2.14E-1	`AJJUL	2.16E-1	FAQUSCL	2.28E-1
	DEADSEA	2.28E-1	BYBLOS	2.31E-1	MTOUNE	2.41E-1	BAQ`AH	2.43E-1	SAHAB	2.48E-1	BEITMIR	2.52E-1	GIBEON	2.52E-1
	APHEK	2.55E-1	IFSHAR	2.61E-1	BETHSH	2.82E-1	IBNHANI	2.85E-1	FUKHAR	2.88E-1	ORONTES	3.14E-1	EBLA	3.21E-1
	`ARQA	3.37E-1	MEGIDDO	3.56E-1	KAZEL	3.57E-1	SIDON	3.94E-1	HILLCL	4.29E-1	RASSHAM	5.91E-1		
AMARNA	MALKATA	1.26E-1	JERICHO	1.59E-1	DABAPAL	1.72E-1	KAHUN	1.78E-1	ASHKEL	1.80E-1	GAZACL	1.81E-1	DABFAY	1.82E-1
	DABACL	1.93E-1	DEADSEA	1.98E-1	BYBLOS	2.02E-1	DABAEG	2.08E-1	FAQUSCL	2.11E-1	MTOUNE	2.11E-1	GIBEON	2.12E-1
	BETHSH	2.12E-1	FAR`AH	2.13E-1	SAHAB	2.14E-1	LACHISH	2.17E-1	BEITMIR	2.20E-1	EBLA	2.20E-1	IFSHAR	2.21E-1
	BAQ`AH	2.21E-1	`AJJUL	2.30E-1	FUKHAR	2.42E-1	IBNHANI	2.51E-1	APHEK	2.66E-1	FAYMARL	2.71E-1	MEGIDDO	2.99E-1
	KAZEL	3.35E-1	`ARQA	3.47E-1	SIDON	3.59E-1	ORONTES	3.61E-1	HILLCL	3.67E-1	RASSHAM	4.74E-1		
MALKATA	GAZACL	8.95E-2	ASHKEL	1.00E-1	DABAPAL	1.13E-1	AMARNA	1.26E-1	FAR`AH	1.29E-1	LACHISH	1.39E-1	FAQUSCL	1.52E-1
	DABAEG	1.52E-1	MTOUNE	1.53E-1	`AJJUL	1.56E-1	KAHUN	1.57E-1	DABACL	1.63E-1	IFSHAR	1.65E-1	DABFAY	1.66E-1
	JERICHO	1.67E-1	BYBLOS	1.69E-1	APHEK	1.77E-1	BEITMIR	1.93E-1	DEADSEA	1.95E-1	GIBEON	2.05E-1	FUKHAR	2.09E-1
	BAQ`AH	2.13E-1	EBLA	2.26E-1	SAHAB	2.33E-1	BETHSH	2.42E-1	IBNHANI	2.59E-1	FAYMARL	2.70E-1	KAZEL	2.71E-1
	MEGIDDO	2.80E-1	`ARQA	3.04E-1	SIDON	3.32E-1	ORONTES	3.44E-1	HILLCL	3.78E-1	RASSHAM	5.06E-1		
`AJJUL	FAR`AH	6.10E-2	ASHKEL	8.79E-2	DABAPAL	9.49E-2	APHEK	9.74E-2	GAZACL	1.13E-1	IFSHAR	1.17E-1	BEITMIR	1.19E-1
	LACHISH	1.21E-1	DABAEG	1.35E-1	MTOUNE	1.41E-1	FUKHAR	1.46E-1	MALKATA	1.56E-1	FAQUSCL	1.84E-1	DEADSEA	1.85E-1
	DABACL	1.87E-1	MEGIDDO	1.87E-1	DABFAY	1.99E-1	KAHUN	2.16E-1	EBLA	2.17E-1	JERICHO	2.23E-1	AMARNA	2.30E-1
	GIBEON	2.34E-1	BAQ`AH	2.37E-1	BYBLOS	2.46E-1	SIDON	2.49E-1	BETHSH	2.77E-1	SAHAB	2.80E-1	IBNHANI	2.86E-1
	FAYMARL	2.91E-1	ORONTES	2.98E-1	KAZEL	3.06E-1	`ARQA	3.46E-1	HILLCL	4.46E-1	RASSHAM	5.09E-1		
ASHKEL	FAR`AH	6.65E-2	GAZACL	7.10E-2	DABAPAL	7.31E-2	LACHISH	7.96E-2	`AJJUL	8.79E-2	APHEK	9.93E-2	MALKATA	1.00E-1
	IFSHAR	1.12E-1	MTOUNE	1.22E-1	DABAEG	1.36E-1	BEITMIR	1.44E-1	FAQUSCL	1.63E-1	JERICHO	1.68E-1	DABACL	1.71E-1
	DEADSEA	1.71E-1	FUKHAR	1.74E-1	DABFAY	1.77E-1	AMARNA	1.80E-1	KAHUN	1.85E-1	GIBEON	1.94E-1	BYBLOS	1.96E-1
	BAQ`AH	2.10E-1	EBLA	2.10E-1	MEGIDDO	2.34E-1	SAHAB	2.41E-1	BETHSH	2.43E-1	IBNHANI	2.72E-1	KAZEL	2.76E-1
	FAYMARL	2.84E-1	SIDON	2.93E-1	ORONTES	3.14E-1	`ARQA	3.17E-1	HILLCL	3.96E-1	RASSHAM	5.07E-1		
FAR`AH	`AJJUL	6.10E-2	ASHKEL	6.65E-2	GAZACL	8.33E-2	APHEK	9.06E-2	DABAPAL	9.57E-2	LACHISH	1.05E-1	DABAEG	1.17E-1
	MALKATA	1.29E-1	IFSHAR	1.35E-1	MTOUNE	1.36E-1	BEITMIR	1.51E-1	FAQUSCL	1.65E-1	FUKHAR	1.66E-1	DABACL	1.67E-1
	DABFAY	1.84E-1	KAHUN	1.91E-1	DEADSEA	1.95E-1	AMARNA	2.13E-1	MEGIDDO	2.22E-1	JERICHO	2.24E-1	EBLA	2.31E-1
	BYBLOS	2.32E-1	GIBEON	2.45E-1	BAQ`AH	2.48E-1	BETHSH	2.83E-1	SIDON	2.83E-1	FAYMARL	2.84E-1	SAHAB	2.85E-1
	IBNHANI	2.85E-1	KAZEL	2.86E-1	ORONTES	3.23E-1	`ARQA	3.38E-1	HILLCL	4.51E-1	RASSHAM	5.13E-1		
LACHISH	ASHKEL	7.96E-2	DABAPAL	1.02E-1	FAR`AH	1.05E-1	GAZACL	1.13E-1	`AJJUL	1.21E-1	APHEK	1.22E-1	IFSHAR	1.33E-1
	MALKATA	1.39E-1	DEADSEA	1.58E-1	BEITMIR	1.63E-1	JERICHO	1.68E-1	DABFAY	1.76E-1	MTOUNE	1.86E-1	DABAEG	1.87E-1
	KAHUN	1.87E-1	GIBEON	1.97E-1	DABACL	2.09E-1	FUKHAR	2.16E-1	AMARNA	2.17E-1	FAQUSCL	2.17E-1	BYBLOS	2.24E-1
	BETHSH	2.29E-1	BAQ`AH	2.33E-1	SAHAB	2.50E-1	EBLA	2.58E-1	MEGIDDO	2.68E-1	FAYMARL	2.70E-1	IBNHANI	3.24E-1
	SIDON	3.26E-1	ORONTES	3.31E-1	KAZEL	3.31E-1	`ARQA	3.56E-1	HILLCL	4.03E-1	RASSHAM	5.54E-1		
BEITMIR	DABAPAL	1.08E-1	FUKHAR	1.13E-1	IFSHAR	1.13E-1	`AJJUL	1.19E-1	ASHKEL	1.44E-1	FAR`AH	1.51E-1	MEGIDDO	1.55E-1
	DEADSEA	1.56E-1	EBLA	1.57E-1	APHEK	1.62E-1	LACHISH	1.63E-1	MTOUNE	1.72E-1	GIBEON	1.81E-1	GAZACL	1.81E-1

TABLE 3–contnued
DISTANCE MATRICES

	JERICHO	1.88E-1	BAQ`AH	1.90E-1	MALKATA	1.93E-1	DABAEG	2.09E-1	AMARNA	2.20E-1	SAHAB	2.23E-1	SIDON	2.23E-1
	DABFAY	2.28E-1	BETHSH	2.29E-1	FAQUSCL	2.45E-1	BYBLOS	2.45E-1	DABACL	2.46E-1	KAHUN	2.52E-1	ORONTES	2.71E-1
	IBNHANI	2.82E-1	FAYMARL	3.06E-1	KAZEL	3.41E-1	`ARQA	3.48E-1	HILLCL	3.92E-1	RASSHAM	4.69E-1		
GAZACL	ASHKEL	7.10E-2	FAR`AH	8.33E-2	MALKATA	8.95E-2	`AJJUL	1.13E-1	LACHISH	1.13E-1	DABAPAL	1.21E-1	APHEK	1.28E-1
	DABAEG	1.29E-1	MTOUNE	1.29E-1	FAQUSCL	1.42E-1	DABACL	1.45E-1	KAHUN	1.45E-1	DABFAY	1.48E-1	IFSHAR	1.66E-1
	BEITMIR	1.81E-1	AMARNA	1.81E-1	JERICHO	1.91E-1	BYBLOS	1.98E-1	FUKHAR	2.01E-1	DEADSEA	2.09E-1	BAQ`AH	2.20E-1
	GIBEON	2.23E-1	IBNHANI	2.43E-1	SAHAB	2.47E-1	EBLA	2.51E-1	FAYMARL	2.51E-1	KAZEL	2.60E-1	MEGIDDO	2.76E-1
	BETHSH	2.85E-1	`ARQA	2.92E-1	ORONTES	3.05E-1	SIDON	3.25E-1	HILLCL	4.12E-1	RASSHAM	5.26E-1		
APHEK	FAR`AH	9.06E-2	`AJJUL	9.74E-2	ASHKEL	9.93E-2	LACHISH	1.22E-1	GAZACL	1.28E-1	DABAPAL	1.28E-1	IFSHAR	1.30E-1
	MTOUNE	1.39E-1	BEITMIR	1.62E-1	FUKHAR	1.64E-1	DABAEG	1.67E-1	MALKATA	1.77E-1	FAQUSCL	1.97E-1	DABACL	2.19E-1
	MEGIDDO	2.29E-1	DEADSEA	2.36E-1	EBLA	2.37E-1	JERICHO	2.41E-1	DABFAY	2.43E-1	BYBLOS	2.50E-1	GIBEON	2.51E-1
	KAHUN	2.55E-1	BAQ`AH	2.58E-1	KAZEL	2.62E-1	AMARNA	2.66E-1	SIDON	2.85E-1	SAHAB	2.91E-1	IBNHANI	3.04E-1
	BETHSH	3.13E-1	`ARQA	3.26E-1	ORONTES	3.29E-1	FAYMARL	3.35E-1	HILLCL	4.41E-1	RASSHAM	5.01E-1		
IFSHAR	DABAPAL	7.13E-2	ASHKEL	1.12E-1	BEITMIR	1.13E-1	`AJJUL	1.17E-1	APHEK	1.30E-1	LACHISH	1.33E-1	FAR`AH	1.35E-1
	FUKHAR	1.44E-1	EBLA	1.55E-1	DEADSEA	1.60E-1	MALKATA	1.65E-1	GAZACL	1.66E-1	MEGIDDO	1.69E-1	MTOUNE	1.81E-1
	GIBEON	1.85E-1	JERICHO	1.88E-1	BYBLOS	2.02E-1	DABAEG	2.11E-1	BETHSH	2.11E-1	BAQ`AH	2.13E-1	AMARNA	2.21E-1
	SIDON	2.23E-1	FAQUSCL	2.43E-1	DABFAY	2.44E-1	SAHAB	2.46E-1	DABACL	2.56E-1	KAHUN	2.61E-1	KAZEL	3.09E-1
	IBNHANI	3.25E-1	ORONTES	3.34E-1	FAYMARL	3.36E-1	`ARQA	3.52E-1	HILLCL	3.84E-1	RASSHAM	4.65E-1		
GIBEON	JERICHO	8.71E-2	BAQ`AH	9.76E-2	SAHAB	1.27E-1	BETHSH	1.70E-1	BEITMIR	1.81E-1	DABAPAL	1.82E-1	IFSHAR	1.85E-1
	BYBLOS	1.87E-1	DEADSEA	1.88E-1	ASHKEL	1.94E-1	LACHISH	1.97E-1	MALKATA	2.05E-1	EBLA	2.10E-1	AMARNA	2.12E-1
	GAZACL	2.23E-1	MTOUNE	2.32E-1	DABFAY	2.33E-1	`AJJUL	2.34E-1	HILLCL	2.35E-1	FAR`AH	2.45E-1	FUKHAR	2.50E-1
	APHEK	2.51E-1	KAHUN	2.52E-1	ORONTES	2.81E-1	FAQUSCL	2.92E-1	DABAEG	2.95E-1	DABACL	2.97E-1	MEGIDDO	3.01E-1
	`ARQA	3.07E-1	FAYMARL	3.08E-1	IBNHANI	3.17E-1	SIDON	3.27E-1	KAZEL	3.51E-1	RASSHAM	5.45E-1		
HILLCL	SAHAB	2.27E-1	GIBEON	2.35E-1	BAQ`AH	2.46E-1	JERICHO	2.71E-1	BYBLOS	3.08E-1	BETHSH	3.32E-1	`ARQA	3.40E-1
	EBLA	3.60E-1	AMARNA	3.67E-1	MALKATA	3.78E-1	IFSHAR	3.84E-1	DABAPAL	3.87E-1	BEITMIR	3.92E-1	ASHKEL	3.96E-1
	DEADSEA	4.01E-1	MTOUNE	4.01E-1	LACHISH	4.03E-1	ORONTES	4.09E-1	GAZACL	4.12E-1	DABFAY	4.19E-1	FUKHAR	4.26E-1
	KAHUN	4.29E-1	KAZEL	4.32E-1	APHEK	4.41E-1	`AJJUL	4.46E-1	IBNHANI	4.46E-1	FAR`AH	4.51E-1	FAQUSCL	4.56E-1
	FAYMARL	4.64E-1	DABACL	4.77E-1	DABAEG	4.86E-1	SIDON	4.90E-1	MEGIDDO	4.92E-1	RASSHAM	6.23E-1		
JERICHO	GIBEON	8.71E-2	SAHAB	1.30E-1	BAQ`AH	1.49E-1	DEADSEA	1.57E-1	BETHSH	1.58E-1	AMARNA	1.59E-1	DABAPAL	1.64E-1
	MALKATA	1.67E-1	LACHISH	1.68E-1	ASHKEL	1.68E-1	BEITMIR	1.88E-1	IFSHAR	1.88E-1	GAZACL	1.91E-1	DABFAY	1.94E-1
	BYBLOS	1.97E-1	KAHUN	2.08E-1	MTOUNE	2.19E-1	`AJJUL	2.23E-1	FAR`AH	2.24E-1	EBLA	2.30E-1	APHEK	2.41E-1
	DABACL	2.53E-1	FUKHAR	2.54E-1	FAQUSCL	2.61E-1	DABAEG	2.62E-1	HILLCL	2.71E-1	FAYMARL	2.76E-1	IBNHANI	2.91E-1
	ORONTES	3.04E-1	MEGIDDO	3.13E-1	`ARQA	3.28E-1	KAZEL	3.57E-1	SIDON	3.62E-1	RASSHAM	5.41E-1		
DEADSEA	DABAPAL	1.39E-1	BETHSH	1.45E-1	BEITMIR	1.56E-1	JERICHO	1.57E-1	LACHISH	1.58E-1	IFSHAR	1.60E-1	ASHKEL	1.71E-1
	`AJJUL	1.85E-1	GIBEON	1.88E-1	FAR`AH	1.95E-1	MALKATA	1.95E-1	AMARNA	1.98E-1	GAZACL	2.09E-1	DABFAY	2.14E-1
	KAHUN	2.28E-1	EBLA	2.36E-1	APHEK	2.36E-1	FUKHAR	2.38E-1	BAQ`AH	2.41E-1	SAHAB	2.45E-1	MEGIDDO	2.47E-1

TABLE 3–contnued
DISTANCE MATRICES

	DABAEG	2.52E-1	MTOUNE	2.52E-1	BYBLOS	2.58E-1	DABACL	2.69E-1	FAQUSCL	2.90E-1	FAYMARL	2.90E-1	SIDON	3.16E-1		
	IBNHANI	3.36E-1	ORONTES	3.41E-1	HILLCL	4.01E-1	KAZEL	4.25E-1	`ARQA	4.27E-1	RASSHAM	5.44E-1				
SAHAB	BAQ`AH	1.14E-1	GIBEON	1.27E-1	JERICHO	1.30E-1	BYBLOS	2.02E-1	AMARNA	2.14E-1	BEITMIR	2.23E-1	DABAPAL	2.27E-1		
	HILLCL	2.27E-1	DABFAY	2.31E-1	MALKATA	2.33E-1	BETHSH	2.34E-1	EBLA	2.38E-1	ASHKEL	2.41E-1	DEADSEA	2.45E-1		
	IFSHAR	2.46E-1	GAZACL	2.47E-1	KAHUN	2.48E-1	LACHISH	2.50E-1	ORONTES	2.54E-1	MTOUNE	2.57E-1	FUKHAR	2.61E-1		
	`ARQA	2.67E-1	FAYMARL	2.73E-1	`AJJUL	2.80E-1	FAR`AH	2.85E-1	IBNHANI	2.89E-1	APHEK	2.91E-1	DABACL	3.15E-1		
	FAQUSCL	3.19E-1	DABAEG	3.28E-1	MEGIDDO	3.45E-1	KAZEL	3.47E-1	SIDON	3.63E-1	RASSHAM	5.20E-1				
BAQ`AH	GIBEON	9.76E-2	SAHAB	1.14E-1	JERICHO	1.49E-1	BYBLOS	1.70E-1	BEITMIR	1.90E-1	EBLA	2.01E-1	DABAPAL	2.01E-1		
	ASHKEL	2.10E-1	IFSHAR	2.13E-1	MALKATA	2.13E-1	MTOUNE	2.18E-1	GAZACL	2.20E-1	AMARNA	2.21E-1	DABFAY	2.24E-1		
	ORONTES	2.29E-1	FUKHAR	2.32E-1	LACHISH	2.33E-1	`AJJUL	2.37E-1	BETHSH	2.38E-1	`ARQA	2.38E-1	DEADSEA	2.41E-1		
	KAHUN	2.43E-1	HILLCL	2.46E-1	FAR`AH	2.48E-1	APHEK	2.58E-1	FAQUSCL	2.85E-1	IBNHANI	2.87E-1	FAYMARL	2.88E-1		
	DABAEG	2.92E-1	DABACL	2.93E-1	MEGIDDO	3.04E-1	SIDON	3.05E-1	KAZEL	3.09E-1	RASSHAM	5.30E-1				
FUKHAR	BEITMIR	1.13E-1	EBLA	1.33E-1	MEGIDDO	1.33E-1	DABAPAL	1.39E-1	IFSHAR	1.44E-1	`AJJUL	1.46E-1	MTOUNE	1.64E-1		
	APHEK	1.64E-1	FAR`AH	1.66E-1	ASHKEL	1.74E-1	SIDON	1.91E-1	GAZACL	2.01E-1	MALKATA	2.09E-1	DABAEG	2.09E-1		
	LACHISH	2.16E-1	BAQ`AH	2.32E-1	DEADSEA	2.38E-1	AMARNA	2.42E-1	FAQUSCL	2.42E-1	GIBEON	2.50E-1	BYBLOS	2.52E-1		
	JERICHO	2.54E-1	DABACL	2.58E-1	SAHAB	2.61E-1	DABFAY	2.69E-1	IBNHANI	2.85E-1	KAZEL	2.87E-1	KAHUN	2.88E-1		
	BETHSH	2.97E-1	ORONTES	2.98E-1	`ARQA	3.24E-1	FAYMARL	3.42E-1	RASSHAM	3.96E-1	HILLCL	4.26E-1				
BETHSH	DEADSEA	1.45E-1	JERICHO	1.58E-1	GIBEON	1.70E-1	DABAPAL	2.03E-1	IFSHAR	2.11E-1	AMARNA	2.12E-1	LACHISH	2.29E-1		
	BEITMIR	2.29E-1	SAHAB	2.34E-1	BAQ`AH	2.38E-1	MALKATA	2.42E-1	ASHKEL	2.43E-1	EBLA	2.43E-1	BYBLOS	2.51E-1		
	DABFAY	2.64E-1	`AJJUL	2.77E-1	KAHUN	2.82E-1	FAR`AH	2.83E-1	GAZACL	2.85E-1	FUKHAR	2.97E-1	MEGIDDO	3.03E-1		
	APHEK	3.13E-1	MTOUNE	3.19E-1	FAYMARL	3.30E-1	DABAEG	3.30E-1	HILLCL	3.32E-1	DABACL	3.35E-1	SIDON	3.48E-1		
	FAQUSCL	3.53E-1	ORONTES	3.98E-1	IBNHANI	4.10E-1	`ARQA	4.47E-1	KAZEL	4.56E-1	RASSHAM	5.47E-1				
MEGIDDO	FUKHAR	1.33E-1	SIDON	1.42E-1	BEITMIR	1.55E-1	EBLA	1.64E-1	IFSHAR	1.69E-1	`AJJUL	1.87E-1	DABAPAL	1.92E-1		
	FAR`AH	2.22E-1	APHEK	2.29E-1	ASHKEL	2.34E-1	DEADSEA	2.47E-1	MTOUNE	2.49E-1	DABAEG	2.58E-1	LACHISH	2.68E-1		
	GAZACL	2.76E-1	MALKATA	2.80E-1	AMARNA	2.99E-1	GIBEON	3.01E-1	BETHSH	3.03E-1	BAQ`AH	3.04E-1	FAQUSCL	3.08E-1		
	JERICHO	3.13E-1	DABACL	3.17E-1	BYBLOS	3.19E-1	DABFAY	3.34E-1	SAHAB	3.45E-1	KAHUN	3.56E-1	IBNHANI	3.61E-1		
	ORONTES	3.66E-1	KAZEL	3.81E-1	RASSHAM	4.00E-1	FAYMARL	4.09E-1	`ARQA	4.34E-1	HILLCL	4.92E-1				
SIDON	MEGIDDO	1.42E-1	FUKHAR	1.91E-1	EBLA	2.00E-1	IFSHAR	2.23E-1	BEITMIR	2.23E-1	`AJJUL	2.49E-1	DABAPAL	2.51E-1		
	FAR`AH	2.83E-1	APHEK	2.85E-1	ASHKEL	2.93E-1	BAQ`AH	3.05E-1	BYBLOS	3.07E-1	MTOUNE	3.13E-1	DEADSEA	3.16E-1		
	GAZACL	3.25E-1	LACHISH	3.26E-1	GIBEON	3.27E-1	MALKATA	3.32E-1	DABAEG	3.41E-1	BETHSH	3.48E-1	AMARNA	3.59E-1		
	JERICHO	3.62E-1	SAHAB	3.63E-1	ORONTES	3.64E-1	DABFAY	3.74E-1	FAQUSCL	3.81E-1	KAZEL	3.84E-1	KAHUN	3.94E-1		
	DABACL	3.95E-1	`ARQA	4.15E-1	IBNHANI	4.20E-1	RASSHAM	4.26E-1	FAYMARL	4.29E-1	HILLCL	4.90E-1				
BYBLOS	MALKATA	1.69E-1	BAQ`AH	1.70E-1	GIBEON	1.87E-1	DABAPAL	1.88E-1	ASHKEL	1.96E-1	JERICHO	1.97E-1	GAZACL	1.98E-1		
	SAHAB	2.02E-1	AMARNA	2.02E-1	IFSHAR	2.02E-1	EBLA	2.18E-1	LACHISH	2.24E-1	KAHUN	2.31E-1	FAR`AH	2.32E-1		
	DABFAY	2.38E-1	MTOUNE	2.44E-1	BEITMIR	2.45E-1	`AJJUL	2.46E-1	APHEK	2.50E-1	BETHSH	2.51E-1	FUKHAR	2.52E-1		
	`ARQA	2.55E-1	DEADSEA	2.58E-1	KAZEL	2.61E-1	FAQUSCL	2.88E-1	DABAEG	2.92E-1	DABACL	3.04E-1	SIDON	3.07E-1		

TABLE 3–contnued
DISTANCE MATRICES

	HILLCL	3.08E-1	FAYMARL	3.10E-1	MEGIDDO	3.19E-1	IBNHANI	3.26E-1	ORONTES	3.44E-1	RASSHAM	4.95E-1		
`ARQA	KAZEL	1.93E-1	BAQ`AH	2.38E-1	BYBLOS	2.55E-1	SAHAB	2.67E-1	MTOUNE	2.68E-1	ORONTES	2.89E-1	GAZACL	2.92E-1
	IBNHANI	3.03E-1	MALKATA	3.04E-1	GIBEON	3.07E-1	ASHKEL	3.17E-1	FAQUSCL	3.23E-1	FUKHAR	3.24E-1	APHEK	3.26E-1
	JERICHO	3.28E-1	EBLA	3.36E-1	KAHUN	3.37E-1	DABAPAL	3.38E-1	DABFAY	3.38E-1	FAR`AH	3.38E-1	HILLCL	3.40E-1
	`AJJUL	3.46E-1	AMARNA	3.47E-1	BEITMIR	3.48E-1	IFSHAR	3.52E-1	LACHISH	3.56E-1	DABACL	3.60E-1	DABAEG	3.62E-1
	FAYMARL	3.81E-1	SIDON	4.15E-1	DEADSEA	4.27E-1	MEGIDDO	4.34E-1	BETHSH	4.47E-1	RASSHAM	5.63E-1		
KAZEL	`ARQA	1.93E-1	MTOUNE	2.22E-1	FAQUSCL	2.58E-1	GAZACL	2.60E-1	BYBLOS	2.61E-1	APHEK	2.62E-1	MALKATA	2.71E-1
	ASHKEL	2.76E-1	FAR`AH	2.86E-1	FUKHAR	2.87E-1	DABAEG	2.94E-1	DABAPAL	3.04E-1	EBLA	3.05E-1	`AJJUL	3.06E-1
	BAQ`AH	3.09E-1	IBNHANI	3.09E-1	IFSHAR	3.09E-1	DABACL	3.18E-1	LACHISH	3.31E-1	AMARNA	3.35E-1	BEITMIR	3.41E-1
	SAHAB	3.47E-1	GIBEON	3.51E-1	KAHUN	3.57E-1	JERICHO	3.57E-1	DABFAY	3.62E-1	MEGIDDO	3.81E-1	SIDON	3.84E-1
	ORONTES	3.96E-1	DEADSEA	4.25E-1	HILLCL	4.32E-1	FAYMARL	4.40E-1	BETHSH	4.56E-1	RASSHAM	4.79E-1		
RASSHAM	EBLA	3.74E-1	FUKHAR	3.96E-1	MEGIDDO	4.00E-1	SIDON	4.26E-1	IFSHAR	4.65E-1	BEITMIR	4.69E-1	AMARNA	4.74E-1
	DABAPAL	4.76E-1	KAZEL	4.79E-1	MTOUNE	4.87E-1	BYBLOS	4.95E-1	IBNHANI	4.95E-1	APHEK	5.01E-1	MALKATA	5.06E-1
	ASHKEL	5.07E-1	`AJJUL	5.09E-1	FAR`AH	5.13E-1	DABAEG	5.14E-1	SAHAB	5.20E-1	GAZACL	5.26E-1	FAQUSCL	5.28E-1
	BAQ`AH	5.30E-1	JERICHO	5.41E-1	DEADSEA	5.44E-1	GIBEON	5.45E-1	DABACL	5.47E-1	BETHSH	5.47E-1	LACHISH	5.54E-1
	`ARQA	5.63E-1	DABFAY	5.83E-1	KAHUN	5.91E-1	ORONTES	6.17E-1	HILLCL	6.23E-1	FAYMARL	6.42E-1		
IBNHANI	MTOUNE	2.11E-1	FAQUSCL	2.25E-1	DABACL	2.38E-1	GAZACL	2.43E-1	AMARNA	2.51E-1	DABAEG	2.51E-1	MALKATA	2.59E-1
	ASHKEL	2.72E-1	BEITMIR	2.82E-1	FAR`AH	2.85E-1	FUKHAR	2.85E-1	KAHUN	2.85E-1	`AJJUL	2.86E-1	BAQ`AH	2.87E-1
	SAHAB	2.89E-1	DABFAY	2.89E-1	JERICHO	2.91E-1	DABAPAL	2.96E-1	`ARQA	3.03E-1	APHEK	3.04E-1	ORONTES	3.06E-1
	KAZEL	3.09E-1	EBLA	3.11E-1	GIBEON	3.17E-1	LACHISH	3.24E-1	IFSHAR	3.25E-1	BYBLOS	3.26E-1	DEADSEA	3.36E-1
	FAYMARL	3.58E-1	MEGIDDO	3.61E-1	BETHSH	4.10E-1	SIDON	4.20E-1	HILLCL	4.46E-1	RASSHAM	4.95E-1		
ORONTES	BAQ`AH	2.29E-1	SAHAB	2.54E-1	BEITMIR	2.71E-1	GIBEON	2.81E-1	DABFAY	2.87E-1	MTOUNE	2.88E-1	`ARQA	2.89E-1
	FAYMARL	2.96E-1	`AJJUL	2.98E-1	FUKHAR	2.98E-1	JERICHO	3.04E-1	GAZACL	3.05E-1	IBNHANI	3.06E-1	KAHUN	3.14E-1
	ASHKEL	3.14E-1	DABAPAL	3.20E-1	FAR`AH	3.23E-1	APHEK	3.29E-1	LACHISH	3.31E-1	IFSHAR	3.34E-1	EBLA	3.37E-1
	DEADSEA	3.41E-1	MALKATA	3.44E-1	BYBLOS	3.44E-1	DABACL	3.51E-1	DABAEG	3.55E-1	FAQUSCL	3.60E-1	AMARNA	3.61E-1
	SIDON	3.64E-1	MEGIDDO	3.66E-1	KAZEL	3.96E-1	BETHSH	3.98E-1	HILLCL	4.09E-1	RASSHAM	6.17E-1		
EBLA	FUKHAR	1.33E-1	IFSHAR	1.55E-1	BEITMIR	1.57E-1	MEGIDDO	1.64E-1	DABAPAL	1.68E-1	SIDON	2.00E-1	BAQ`AH	2.01E-1
	MTOUNE	2.07E-1	GIBEON	2.10E-1	ASHKEL	2.10E-1	`AJJUL	2.17E-1	BYBLOS	2.18E-1	AMARNA	2.20E-1	MALKATA	2.26E-1
	JERICHO	2.30E-1	FAR`AH	2.31E-1	DEADSEA	2.36E-1	APHEK	2.37E-1	SAHAB	2.38E-1	BETHSH	2.43E-1	GAZACL	2.51E-1
	LACHISH	2.58E-1	DABAEG	2.66E-1	FAQUSCL	2.83E-1	DABFAY	3.03E-1	DABACL	3.04E-1	KAZEL	3.05E-1	IBNHANI	3.11E-1
	KAHUN	3.21E-1	`ARQA	3.36E-1	ORONTES	3.37E-1	HILLCL	3.60E-1	RASSHAM	3.74E-1	FAYMARL	3.85E-1		
MTOUNE	FAQUSCL	1.17E-1	ASHKEL	1.22E-1	DABAEG	1.27E-1	GAZACL	1.29E-1	FAR`AH	1.36E-1	APHEK	1.39E-1	`AJJUL	1.41E-1
	MALKATA	1.53E-1	DABAPAL	1.58E-1	DABACL	1.62E-1	FUKHAR	1.64E-1	BEITMIR	1.72E-1	IFSHAR	1.81E-1	LACHISH	1.86E-1
	EBLA	2.07E-1	IBNHANI	2.11E-1	AMARNA	2.11E-1	BAQ`AH	2.18E-1	JERICHO	2.19E-1	KAZEL	2.22E-1	GIBEON	2.32E-1
	DABFAY	2.32E-1	KAHUN	2.41E-1	BYBLOS	2.44E-1	MEGIDDO	2.49E-1	DEADSEA	2.52E-1	SAHAB	2.57E-1	`ARQA	2.68E-1
	ORONTES	2.88E-1	SIDON	3.13E-1	BETHSH	3.19E-1	FAYMARL	3.31E-1	HILLCL	4.01E-1	RASSHAM	4.87E-1		

Bivariate plots (Figs. 3-21) generated by RQ-mode principal components analysis (Neff 1994), based on the correlation matrices of standardized log concentrations, summarize and refine the inferences drawn above. The first two components, which account for 60-90% of the variance in the data, are shown. The advantages of this graphical representation are that variations in group shape (such as differential elongation) can be readily seen, and directly related to concentrations of specific elements.

The Egyptian Nile alluvial and marl clays, for example, are clearly distinguished on Fig. 3. MAADI is a composite group of a marl clay source of the Fayyum (Qasr el-Sagha formation), Middle Kingdom and 13th Dynasty pottery and clay from the site of Kahun in the Fayyum, and imported pottery made of the same clay found at Tell el-Dab`a; this designation was used, because the contemporaneous Maadi formation shales in the region south of Cairo are similar in composition to that of the Qasr el-Sagha formation, as are the secondary Pleistocene deposits in the Fayyum basin (Tobia and Sayre 1974: 108-12; McGovern 1997a; Arnold 1981). It can be seen that the the 95% (2-sigma) probability ellipse of the MAADI samples does not overlap at all with that of the Nile alluvial clay group at Tell el-Dab`a (DABAEG), assuring confident assignments to one group or the other. The elemental vectors more or less perpendicular to the long axes of the ellipses indicate that greater amounts of Mn and lesser amounts of Cs and Th in DABAEG, or vice versa for MAADI, account for their separation. Although the Theban marl pottery (MALKATA) ellipse considerably overlaps with that of MAADI, all of the Theban samples cluster closely together, with no intrusive Fayyum-Maadi marl clay samples, thereby adequately distinguishing it from the latter. The el-Amarna marl clay group, although represented by only a few samples at present, also occupies a separate elliptical space. A presumed western oasis marl sample (PMG331--published in McGovern 1997a) cannot be distinguished from the Fayyum-Maadi marl clay. Among the elements contributing to the elongation of all the groups along the first component, which accounts for most of the variance, Eu, Sc, Cr, and Fe particularly stand out.

The picture (Fig. 4) is more complex for a number of selected Levantine groups. Many samples, principally Southern Palestinian imports to Tell el Dab`a (DABAPAL), are clustered around the origin of the graph. On the periphery, more northern (Ras Shamra, Tell Kazel, Tell `Arqa, and Orontes Valley sites) or more inland (Beth Shan, Baq`ah Valley, and the central Hill Country pottery and Moza Formation marl clay) groups can be distinguished. Although not labeled on the figure, diamonds with central dots indicate samples from Ebla, and bold crosses indicate samples from Sidon. These groups, as well as several Byblos samples (labeled JH0443-445), are also distinguishable from the DABAPAL group. The importance of greater amounts of Cr, Mn, and Co for more northern Levantine groups, which was stressed above in the visual inspection of the data, is apparent in the graph. Eu, Sc, and Fe again figure importantly in the separation of groups along the first component (x-axis), in addition to Yb and Sm.

A more clear-cut representation of the differences between groups emerges if RQ-mode principal components analysis is carried for two groups at a time. In Fig. 5, the Southern Palestinian imports at Tell Dab`a are largely separated from one another on the basis of Mn, Sc, Fe, Co, and Na. As already pointed out above, Mn, Cs and Th, and to a lesser extent K, Ba and Co, account for most of the chemical differences between Fayyum-Maadi marl clay (MAADI) and the Nile alluvial clay group at Tell el Dab`a (Fig. 11). In the case of the Theban marl clay group (MALKATA), elemental concentrations Cs, Th, K, Na, Ba, and Co, whether more or less, are crucial in discriminating it from the Nile alluvial clay group at Tell el Dab`a (Fig. 7).

The same kind of analysis can be applied to bivariate plots of the first two principal components for the various Levantine groups and the Southern Palestinian import group at Tell el-Dab`a (DABAPAL). Thus, Ba, and sometimes Mn, Na and Hf, serve to distinguish the central Hill Country groups (Gibeon and Moza Formation marl clay [HILL COUNTRY]), a Jordan Valley group (Jericho), and a central Transjordanian group (Baq`ah Valley) from the red loess clay of Southern Palestine (see Figs. 8-11). Moving northwards, the same elements continue to be important, but other elements enter the picture: Yb and Co in the case of a Jezreel Valley group (Beth Shan--Fig. 12), and Cs and K for the Sidon, Byblos, Tell `Arqa, and Tell Kazel groups (Figs. 13-16) of coastal Lebanon and Syria. A shift to higher values of all elements, vis-à-vis Southern Palestine (i.e., the Gaza group of Middle Bronze Age [Southern Palestine] sites and the characteristic red loess clay of the region), is evident for Tell `Arqa and the Syrian sites (Figs. 16-21), except Ras Shamra (Fig. 18) and Ebla (Fig. 20). One might have expected the Ras Shamra group to be comparable to that of Tell Ibn Hani (Fig. 17), since the two sites are close together and Ibn Hani was the port for Ras Shamra (ancient Ugarit). Figures 18 and 19 show that greater amounts of Cr and Ba, together with lesser amounts of Hf, Na, K and Th, distinguish the Ras Shamra group from both DABAPAL and the Ibn Hani group. In addition, the Ibn Hani samples are much more enriched in Cs, Rb, Fe, and Sc, than those that comprise the Ras Shamra group. It should also be noted that the Ibn Hani group differs from DABAPAL in having considerably more Cs, Rb, and Cr, as do the Ebla and Orontes Valley (Fig. 21) groups. A more variable pattern of clay compositions in inland Syria, as pointed out above, emerges from further consideration of the Ebla and Orontes Valley plots; Ebla is also distinguished from DABAPAL by having lesser amounts of Hf, Na, Ba, and Yb, and more Th distinguishes the Orontes Valley group.

Since any numerical pattern recognition technique has limitations, the Mahalanobis distance probability calculations using large groups of samples and a reliable, complete set of elemental data is still the "workhorse" of our analytical program (above). As the database continues

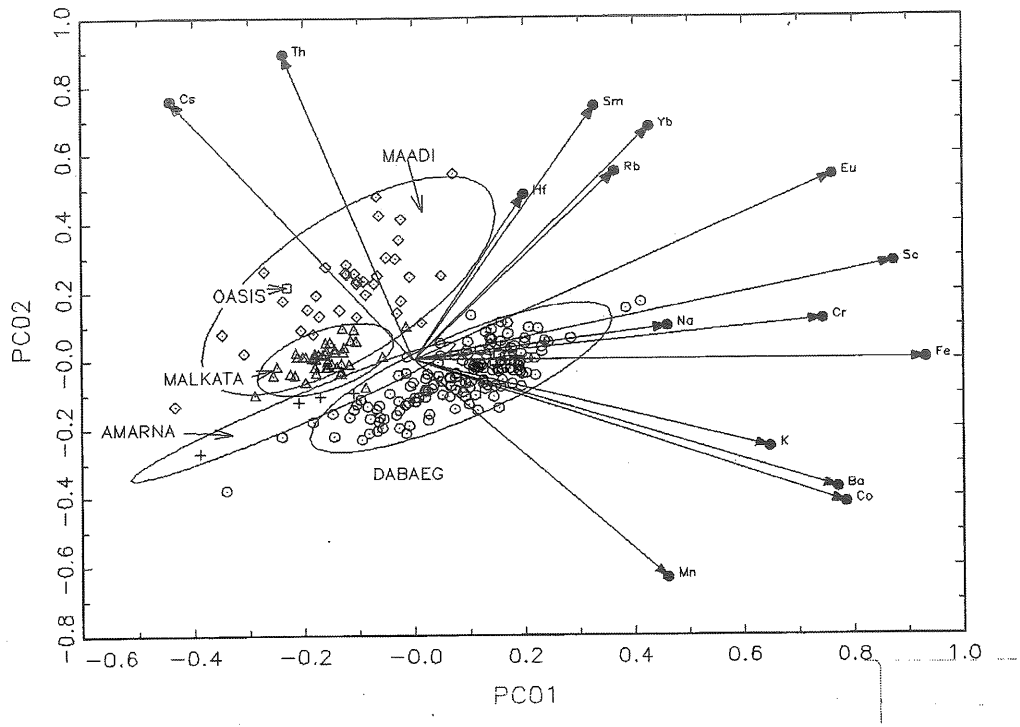


Fig. 3: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for Egyptian compositional groups, including a Nile alluvial pottery and clay group at Tell el-Dab`as (DABAEG), a composite group of pottery and clay samples from Tell el-Dab`a and Middle Egypt derived from the Upper Eocene Egyptian marl clay that extends from the Fayyum to Maadi (MAADI), and New Kingdom amphora groups representing marl clays at Malkata (Thebes), el-Amarna, and the western oases.

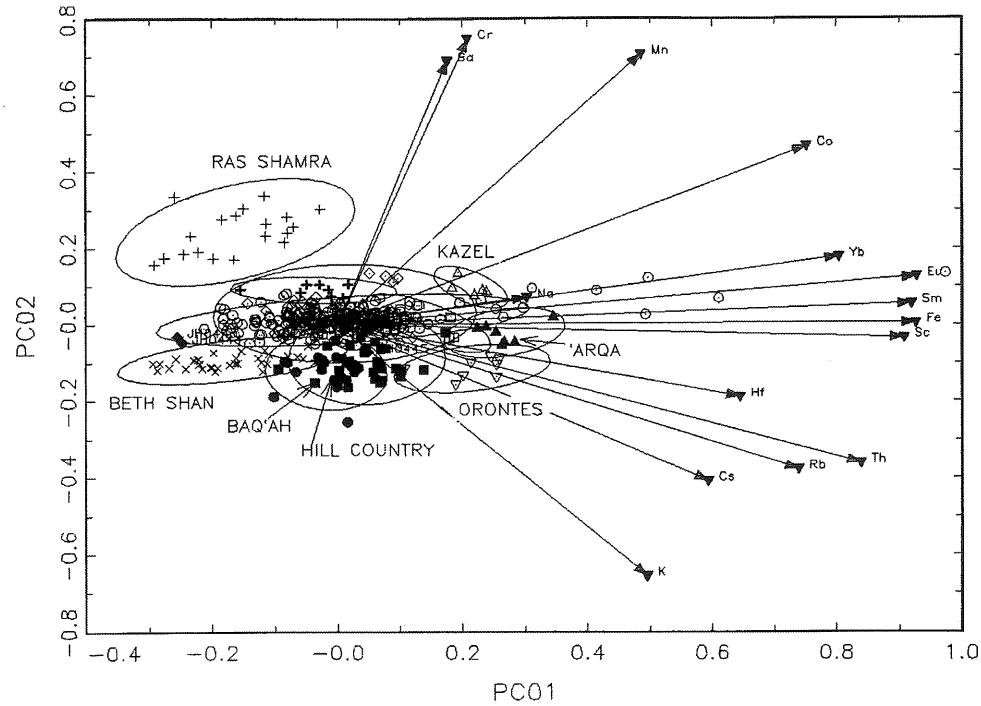


Fig. 4: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for selected Levantine local compositional groups, including Tell Kazel, Tell `Arqa, several sites in the middle Orontes Valley (Qatna, Selimiye, Osmaniye, and near Tell `As), a central Palestinian Hill Country group comprised of marl clay of the Moza Formation, an Late Bronze Age-Iron IA pottery and clay group for sites (Jebel el-Hawayah, Jebel al-Qesir, and Khirbet Umm ad-Dananir) in the Baq`ah Valley of central Transjordan, an Late Bronze IIB group from Beth Shan in the eastern Jezreel Valley, and Ras Shamra along the north Syrian coast. Diamonds with central dots indicate samples from Ebla, and bold crosses indicate samples from Sidon. Several Byblos samples are labeled JH0443-445.

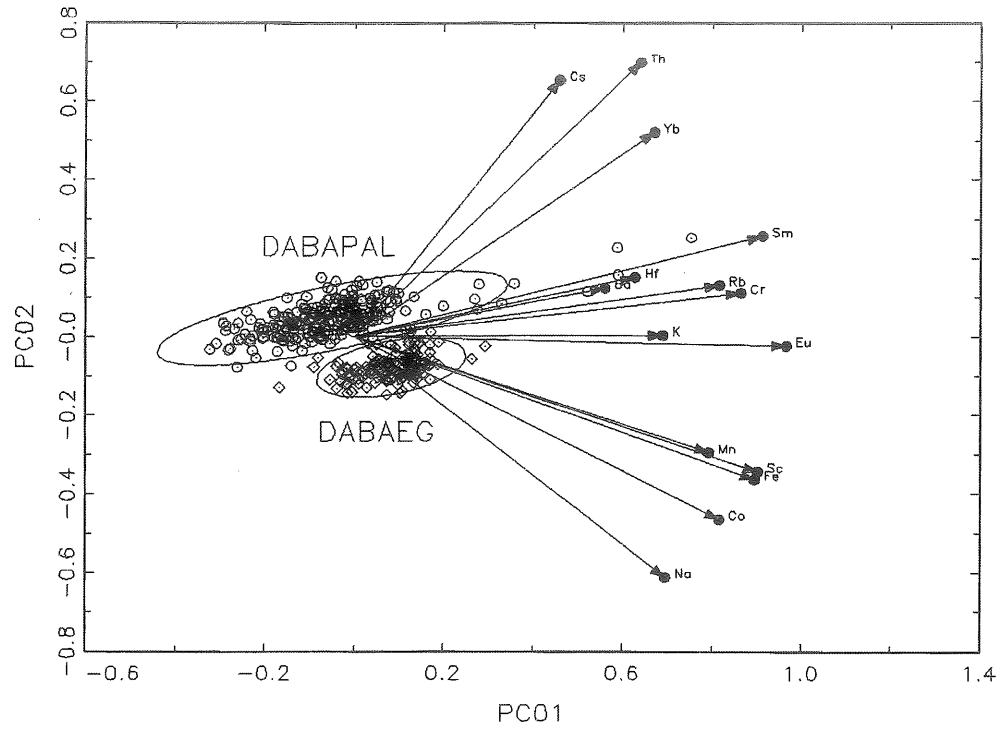


Fig. 5: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL) and the local Nile alluvial pottery and clay group at the site (DABAEG).

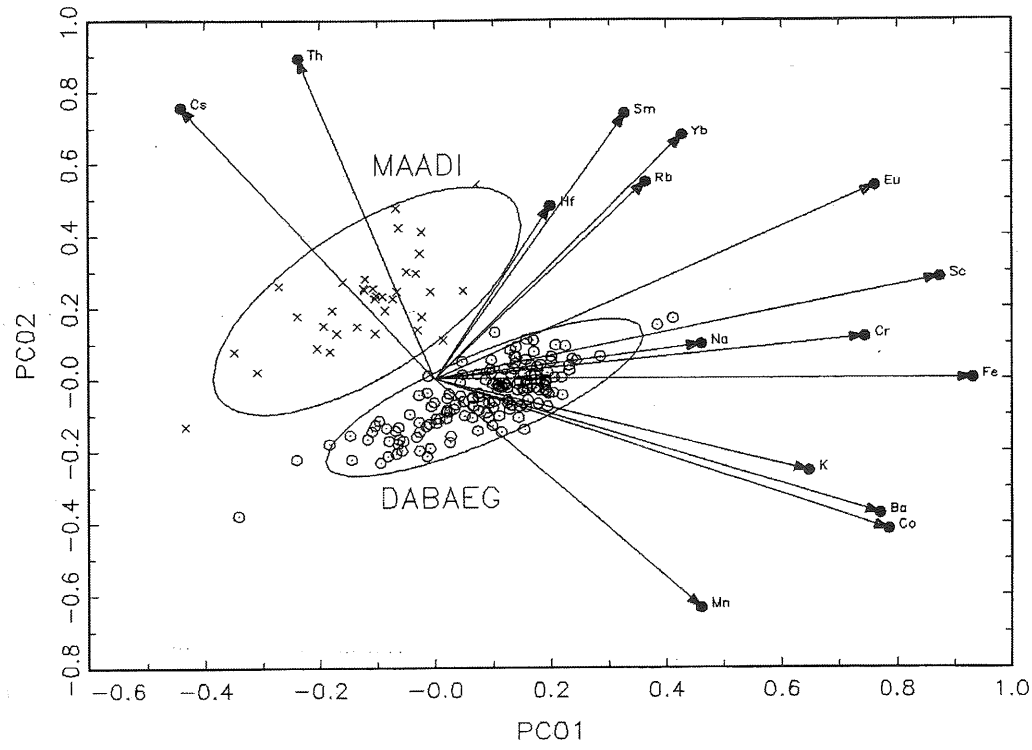


Fig. 6: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Fayyum-Maadi pottery and marl clay group (MAADI) and the local Nile alluvial pottery and clay group at the Tell el-Dab`a (DABAEG).

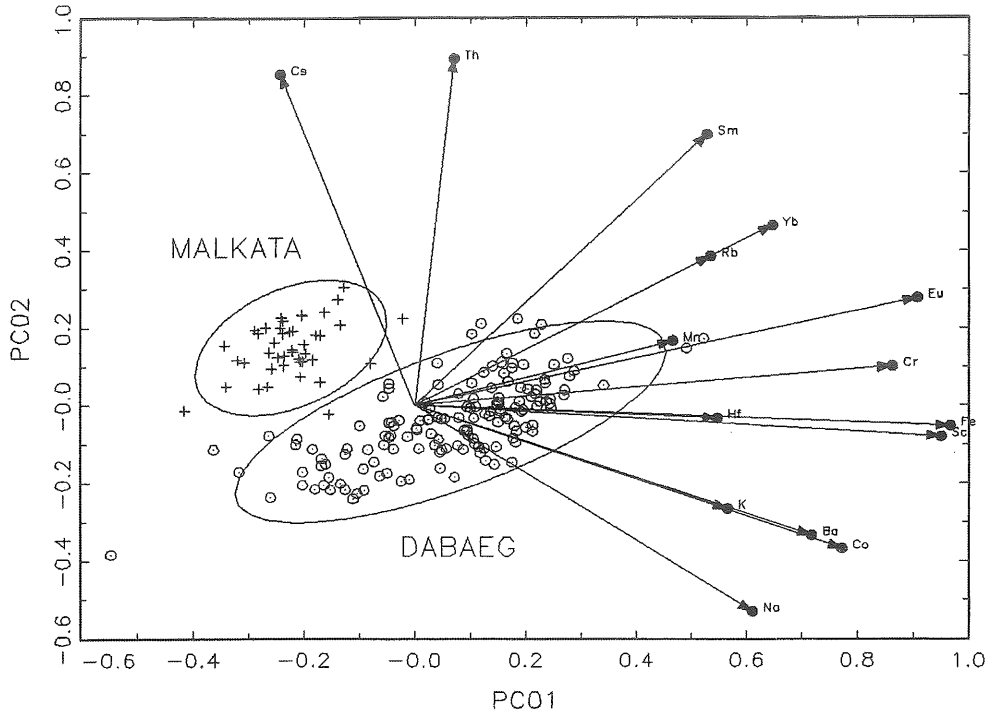


Fig. 7: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the New Kingdom amphora and marl clay group at Malkata (Thebes) and the local Nile alluvial pottery and clay group at the Tell el-Dab`a (DABAEG).

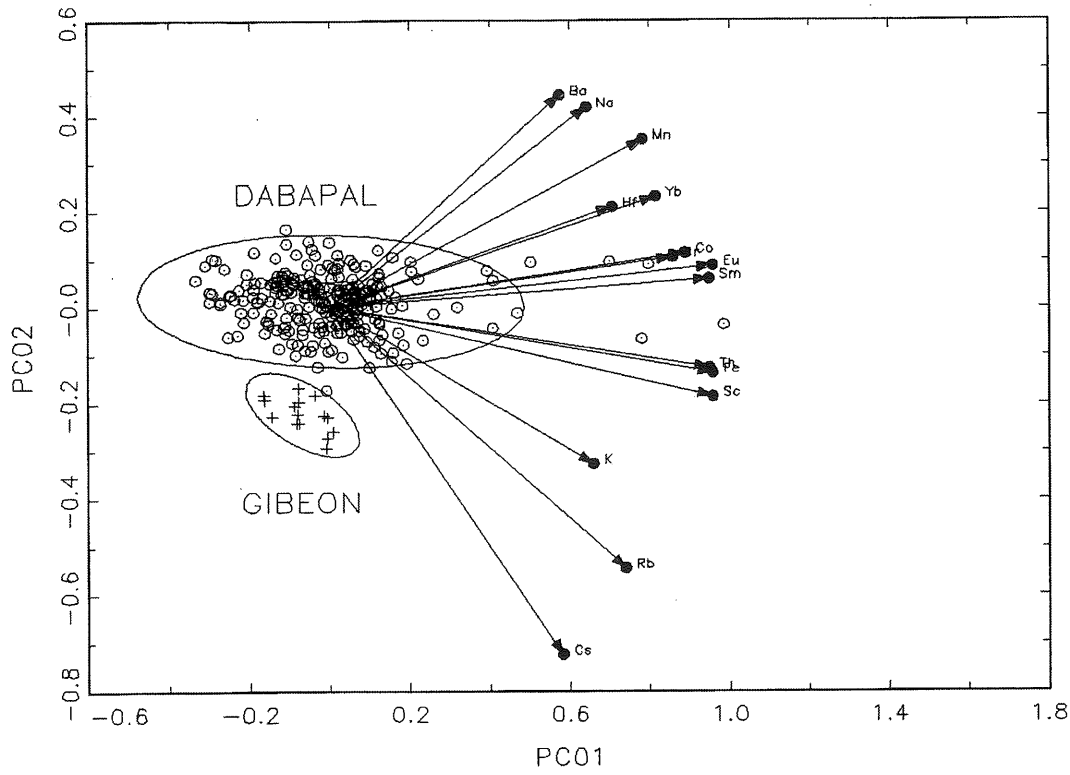


Fig. 8: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the central Palestinian Hill Country group of pottery from the el-Jib/Gibeon and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

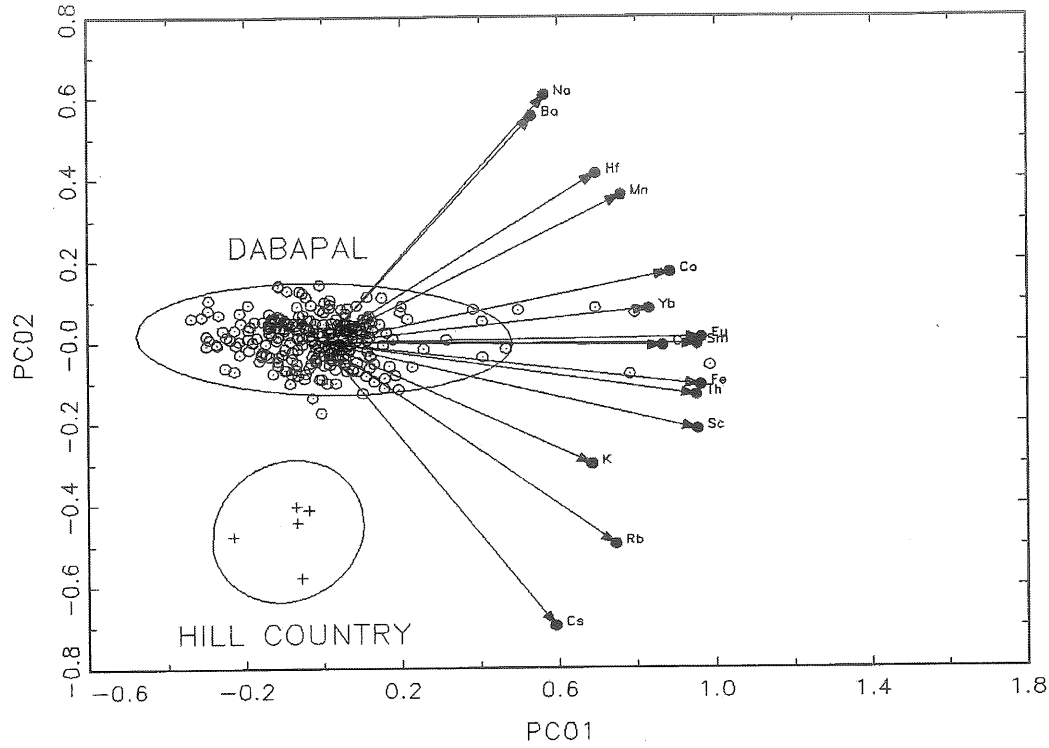


Fig. 9: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the central Palestinian Hill Country group of Moza Formation marl clay, which is closely related to the el-Jib/Gibeon pottery group (Fig. 13), and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

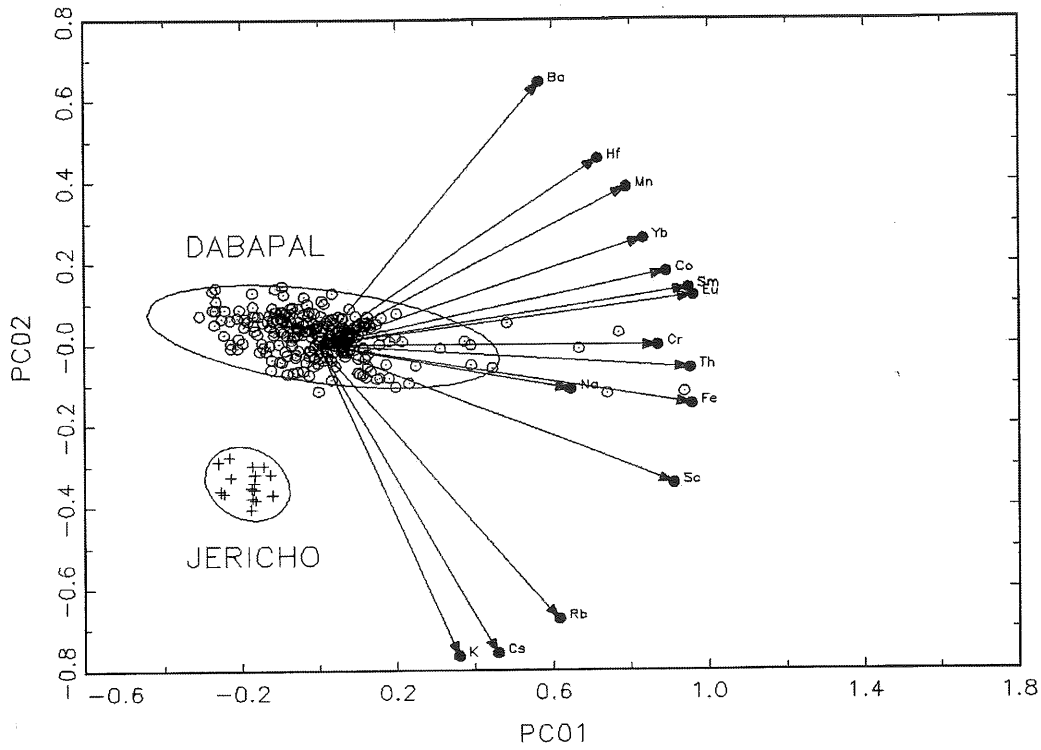


Fig. 10: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Jericho group in the southern Jordan Valley and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

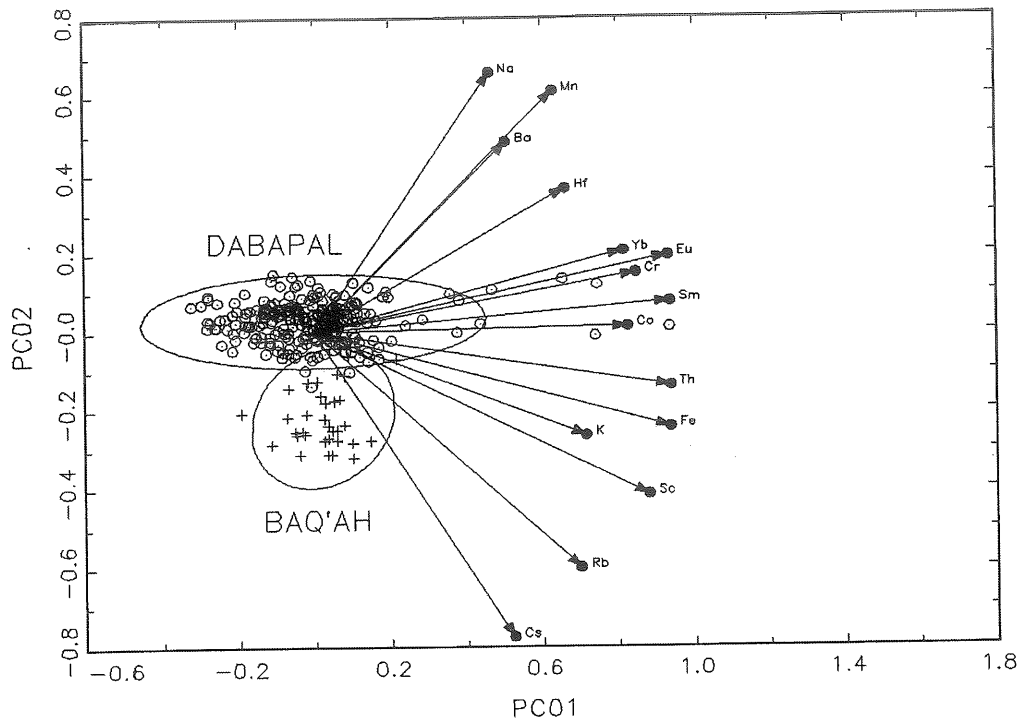


Fig. 11: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Late Bronze Age-Iron IA pottery and clay group for sites in the Baq`ah Valley of central Transjordan and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

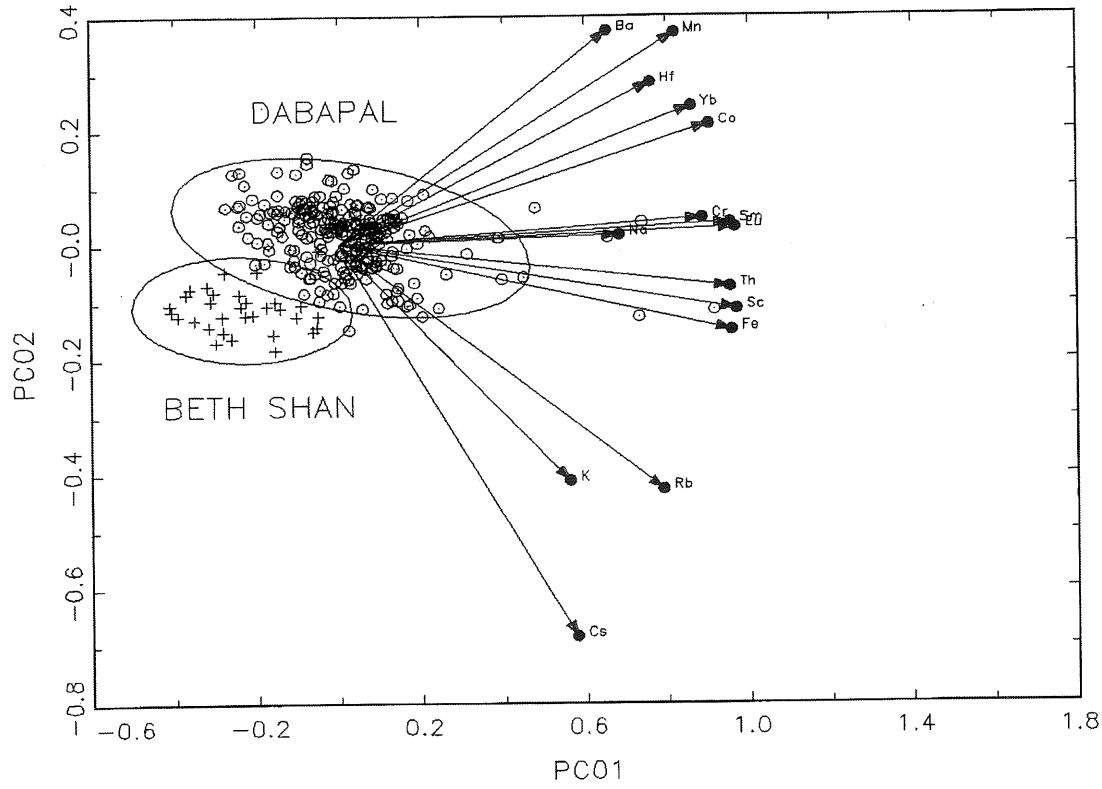


Fig. 12: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Late Bronze IIB group at Beth Shan in the eastern Jezreel Valley and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

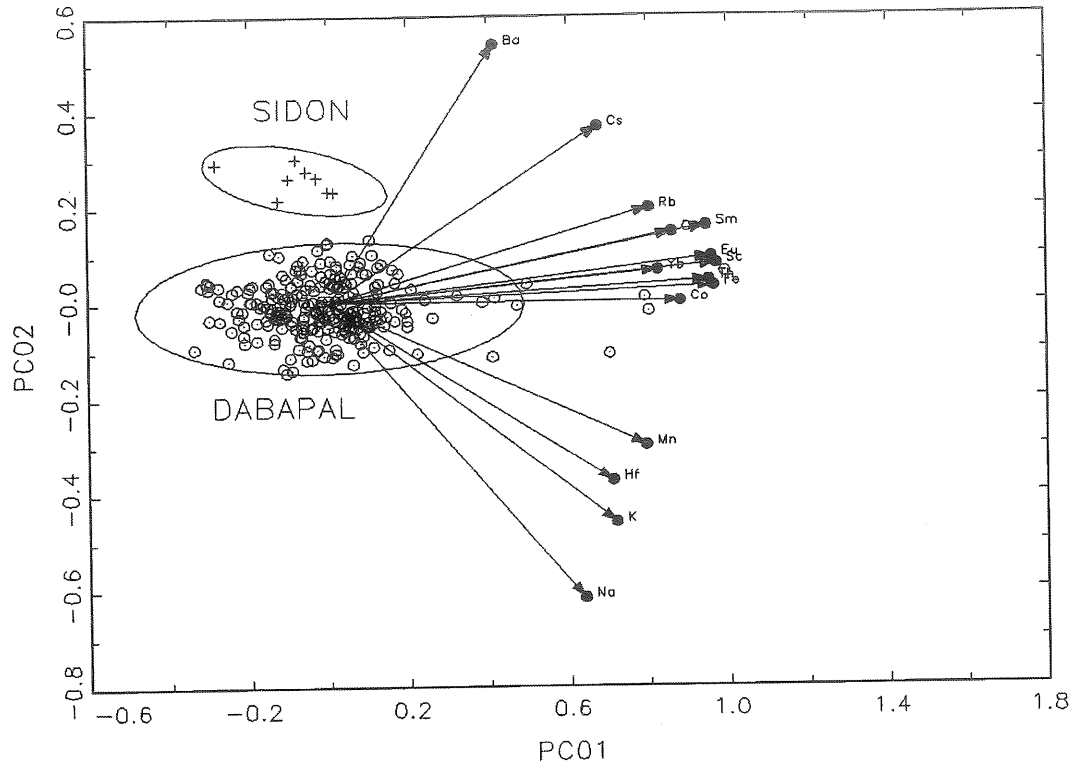


Fig. 13: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Sidon group along the southern Lebanese coast and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

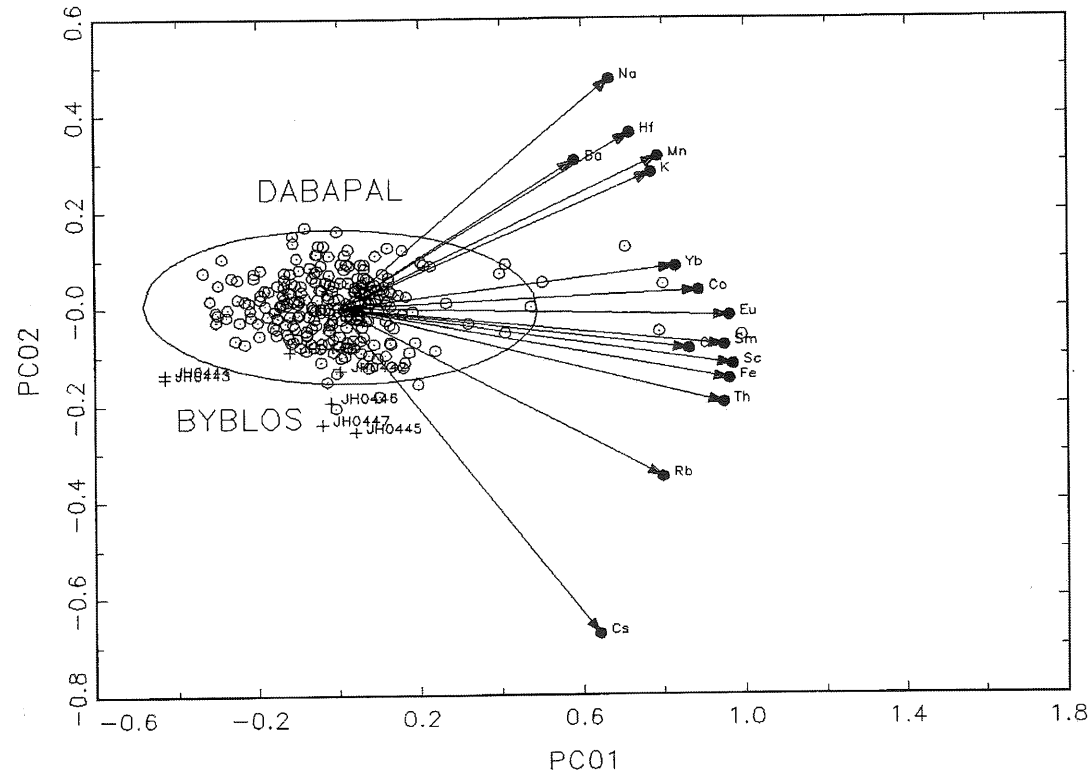


Fig. 14: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for samples (JH0443-447) from Byblos along the central Lebanese coast and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

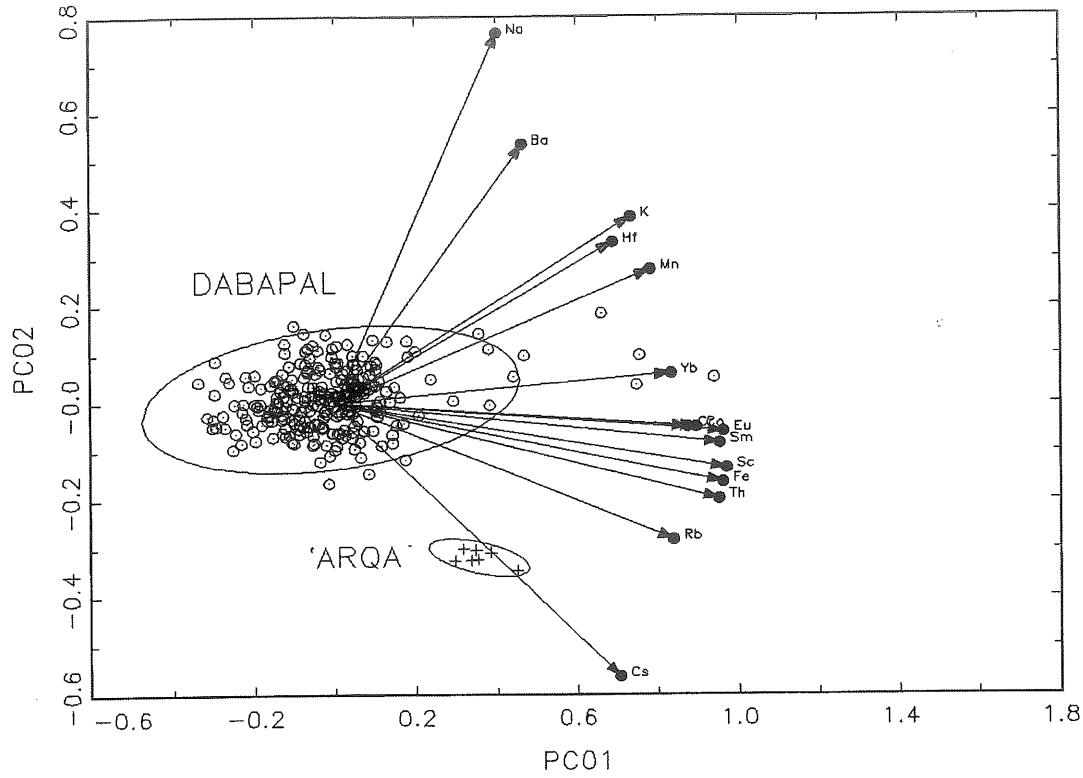


Fig. 15: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Tell `Arqa group along the northern Lebanese coast and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

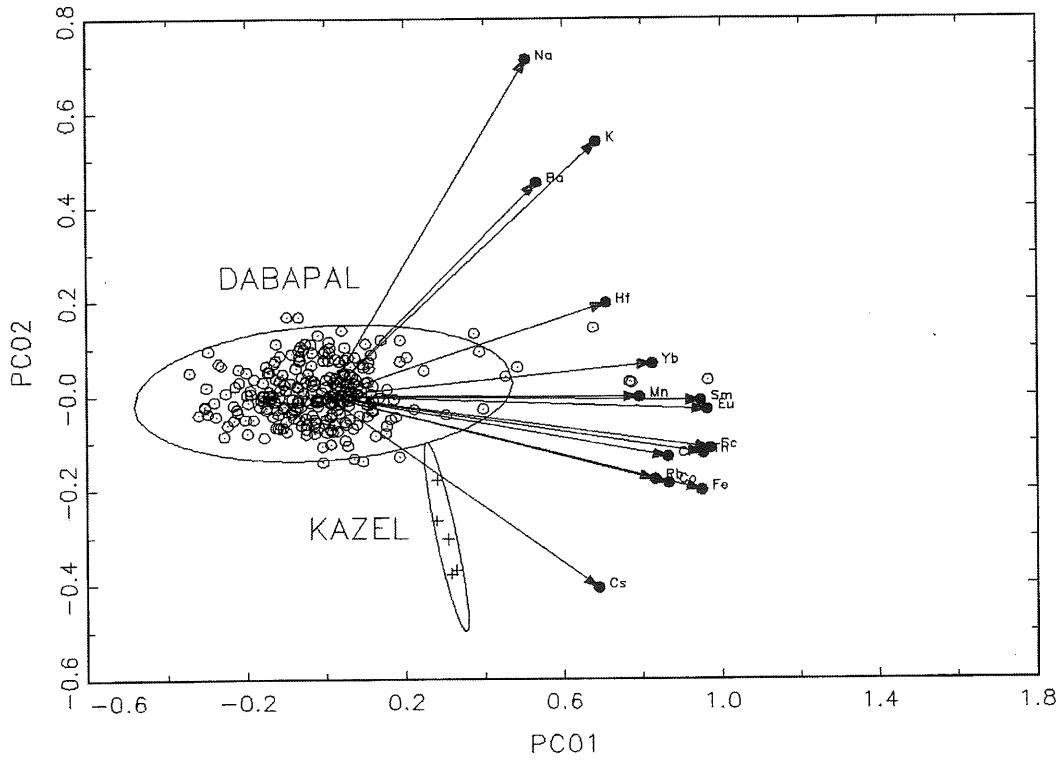


Fig. 16: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Tell Kazel group along the southern Syrian coast and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

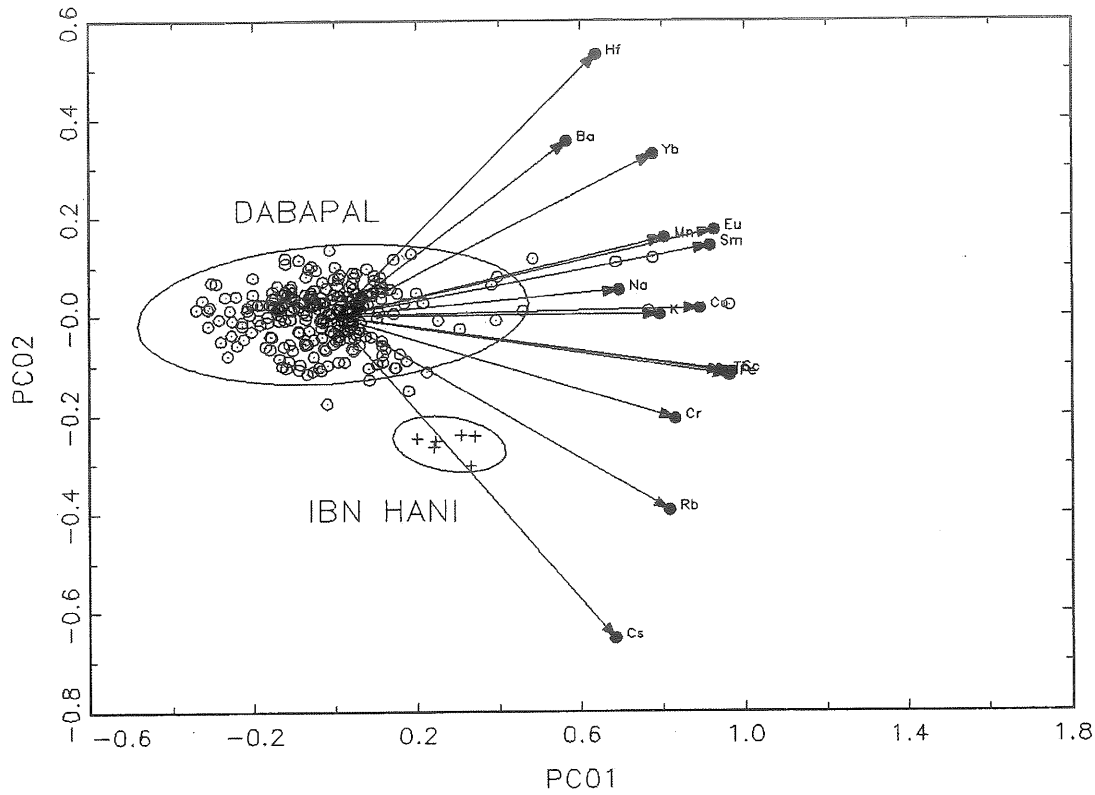


Fig. 17: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Tell Ibn Hani group along the northern Syrian coast and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

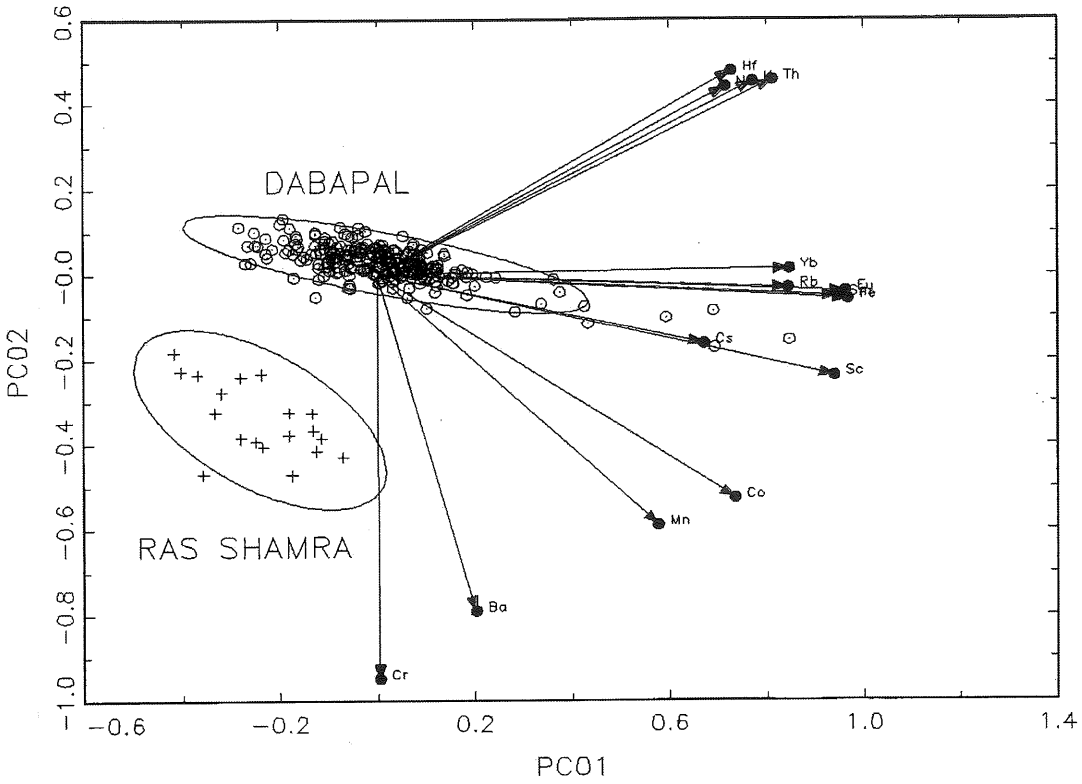


Fig. 18: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Ras Shamra group along the northern Lebanese coast and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

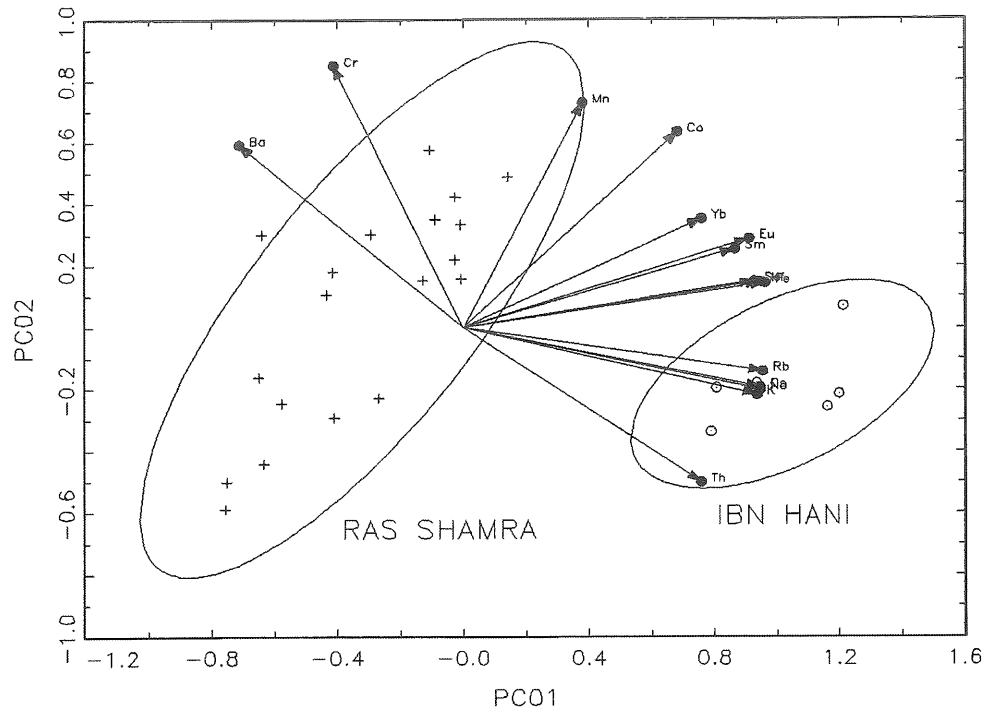


Fig. 19: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Tell Ibn Hani and the Ras Shamra groups along the northern Syrian coast.

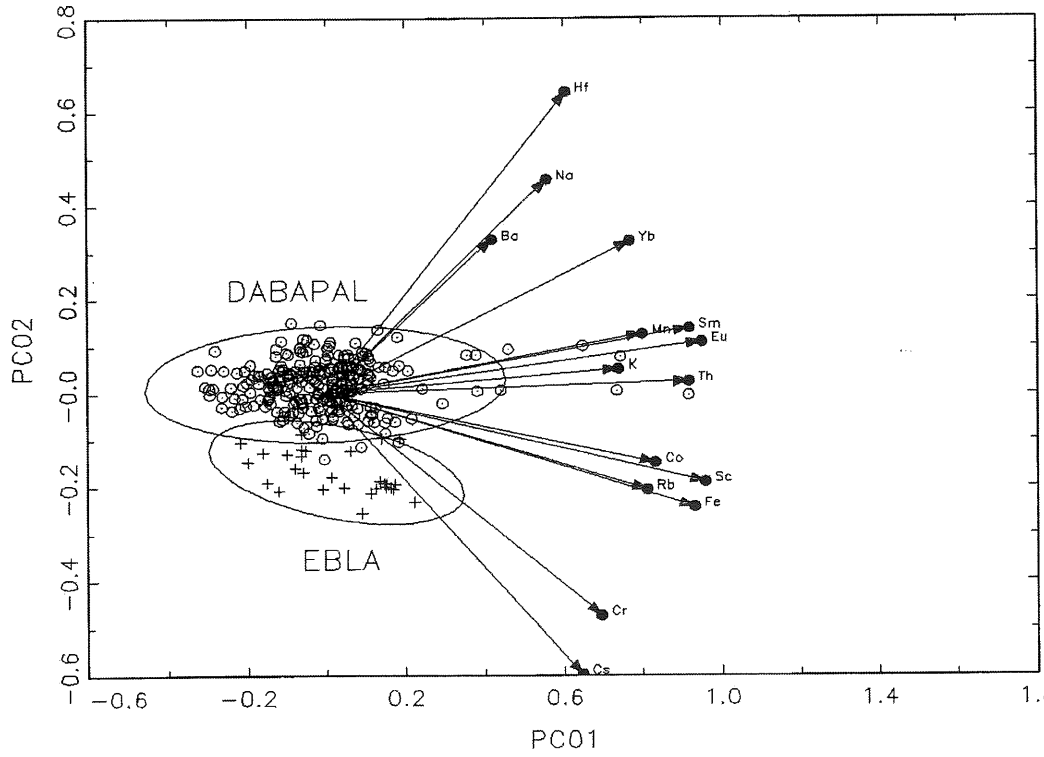


Fig. 20: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for the Ebla group in north-central inland Syria and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

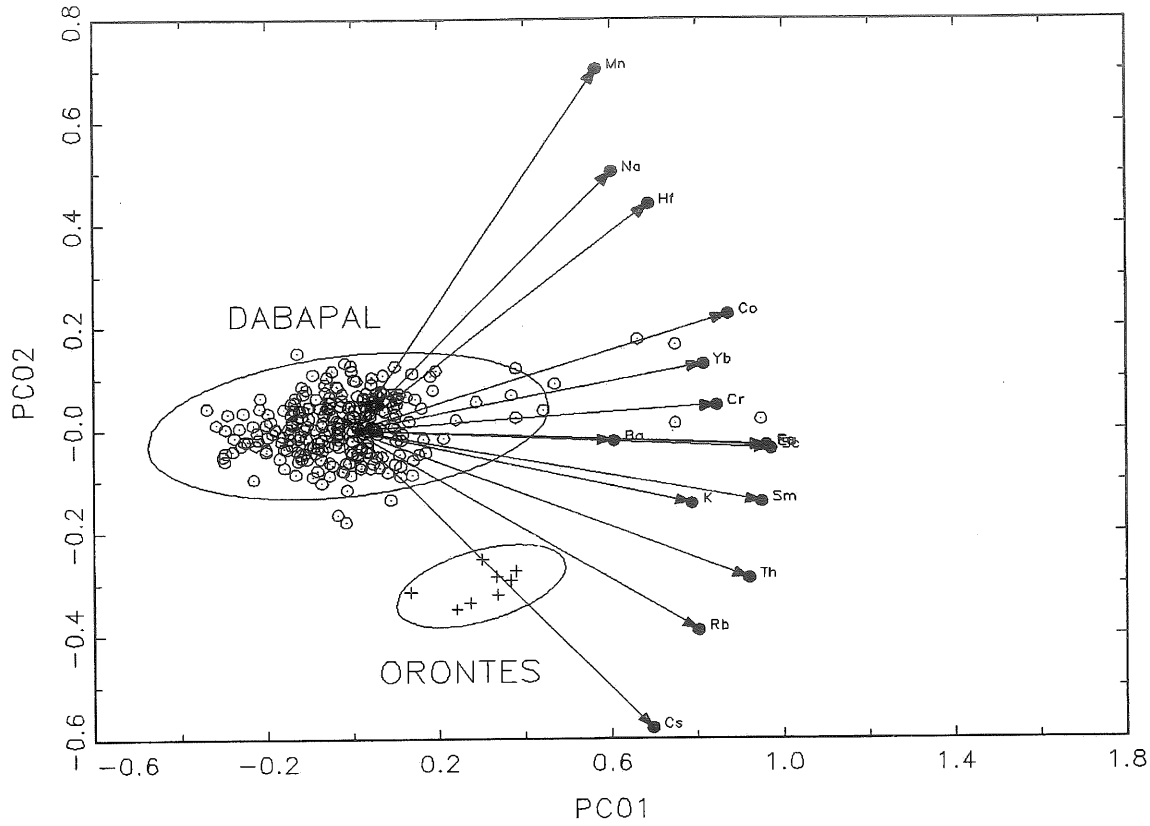


Fig. 21: Plot of variable and object loadings on the first Principal Components (PC01 and PC02) obtained from RQ-mode Principal Component Analysis of the log-normalized data for middle Orontes Valley group in central inland Syria and the large group of imports from Southern Palestine found at Tell el-Dab`a (DABAPAL).

to grow, individual samples and groups will need to be retested by the battery of statistical tests and graphical methods.

Most important for this study, 49 MB pottery samples from the so-called "Gaza group of Middle Bronze Age sites" formed a tight chemical group with 9 red loess clays of the region (for details, see next section). Using the mean concentrations of the fifteen elements, the MDP that the Gaza group of pottery and clays belongs to the large, well-defined Dab`a group is close to 100%. Remarkably, all other well-defined local groups in the Old World data bank had a 0% probability of belonging to the Dab`a group. It is virtually certain therefore that the 268 pottery vessels comprising this group at Tell el-Dab`a were produced in Southern Palestine and exported to the northeastern Nile Delta. Because of the homogeneity of the red loess clay in this region, it is extremely difficult to isolate specific sites or workshops that produced the amphoras that eventually made their way to Tell el-Dab`a. In MED space, the locally defined groups at Tell el-`Ajjul and Ashkelon are especially close to many of the Dab`a specimens.

The other large group of samples from Tell el-Dab`a (total of 161 examples) are made of Nile alluvial clay. High MDP values, averaging above 90%, of the combined group of Tell el-Dab`a samples and 12 samples from the nearby modern clay bed at Faqus, which is further supported by the nearness of these samples in MED space, suggests that most of the Dab`a samples were produced in the vicinity of the site. Because of the mixing of sediments along the course of the Nile, the alluvial clays are notoriously inhomogeneous (Allen and Hamroush 1984).

Small numbers of samples were imported from the Fayyum-Maadi region (10 examples) and coastal and inland Levantine areas to the north of Southern Palestine (7 examples). They are discussed in more detail in the chapters that follow.

5. NAA Database and Local Groups

Appendices 1 and 2 fully document the corpus of pottery from Tell el-Dab`a and other Levantine and Egyptian sites that were specifically sampled and analyzed because of their relevance to the significance of Syro-Palestinian pottery at Tell el-Dab`a. In general, these samples and the local chemical groups (data tables in Appendix 3; individual group memebers indicated by an asterisk or pound-sign in Appendices 1 and 2) that have been defined statistically are not published elsewhere. Several relevant groups (e.g., Beth Shan and Khirbet Umm ad-Dananir in the Baq`ah Valley of Jordan), however, have been published and are cited below. Previous Brookhaven projects (e.g, Kaplan 1980; Brooks et al. 1974) also

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account for 1208 pottery and clay samples from 79 additional Egyptian and Levantine sites in the databank.

The clays that have thus far been analyzed date from the Lower Cretaceous period to recent times and derive from deposits thoughout the Levant and Egypt. Egyptian alluvial and marl clays, red loess clays of the southern Palestinian coastal region, yellow limestone-derived clays of the Palestinian Hill Country (Moza Formation), Transjordanian smectites and kaolin clays, and other clay sources are well represented in the NAA data bank.

Tell el-Dab`a (Tables 8 and 10-14 in Appendix 3)

Tell el-Dab`a accounts for 605 pottery and clay samples in this study. To date, 290 Canaanite Jars or amphoras (see Chapter 2) from MBA levels at Tell el-Dab`a have been analyzed by NAA, constituting nearly half of the Dab`a corpus. Other Syro-Palestinian pottery types include highly Polished jars, jugs/juglets and bowls (155 examples; Chapter 3), Tell el-Yahudiyeh juglets (38 examples, to be discussed in a forthcoming monograph by M. Bietak; one example [JH338] is illustrated and treated in McGovern, et al. 1994), and Levantine Painted Ware (55 examples; Chapter 4). These vessel types, like the Canaanite Jar, were traded throughout the Eastern Mediterranean, as well as within Egypt, during the MBA. In addition, 67 Miscellaneous samples, including a range of local Egyptian and Syro-Palestinian types of bowls, jars, cooking pots, Cypriot vessels, etc., were analyzed (Chapter 5).

The relative numbers and NAA proveniences for each major pottery class at Tell el-Dab`a is tabulated in Table 4. The total number of vessels analyzed from period to period is approximately the same, except for the later sub-periods of the MBA, viz., MB IIA (159 examples), MB IIA-B (138 examples), MB IIB (168 examples), MB IIB-C (64 examples), MB IIC (26 examples), and an additional 21 examples of uncertain date. The majority of the samples were made from either Southern Palestinian loess clay (labeled SP, and comparable to the chemical profile for the Gaza group of sites) or Nile alluvial clay.

Other Egyptian and Levantine samples and groups are represented by 922 pottery and clay samples from 55 coastal and inland sites of Syria, Lebanon, Jordan, and Israel and from 10 sites along the Nile and in the western oases (see Fig. 1. for selected sites). An overview of the provenience, dating, probable origin, definition of local groups, collection procedures, and the significance of these samples follows (see Appendix 2, for fuller details, including published illustrations).

Other Nile Delta sites (Table 46 in Appendix 2)

Only one Tell el-Yahudiyeh juglet (JH170) of uncertain type from the Petrie excavations at Tell el-Yahudiyeh (1906; also see Tufnell 1979) is included in this corpus. It was made of Nile alluvial clay. Many more NAA analyses of Tell el-Yahudiyeh ware from Tell el-Yahudiyeh are documented in Kaplan 1980.

A marl clay sample (JHC023) from Tell el-Maskhuta in the Wadi Tumilat appears to belong to have a distinctive chemical profile, as yet undefined. On-going NAA analyses of pottery and clay from this site (Holladay 1982) should resolve the issue.

Middle Egypt, including the Fayyum Oasis (Tables 15 and 16 in Appendix 3; also see Table 46 for unassigned samples)

Four amphora body sherds (JH141-144) from late Middle Kingdom through mid-13th Dynasty contexts at Dahshur (cf. P. Beck in Arnold 1982: 41-42, fig. 13) were chosen, because they were believed to be imported. Except for JH141, which is of Fayyum-Maadi region marl clay (below), the other specimens are of uncertain origin.

TABLE 4

NAA PROVENIENCES OF MAJOR MIDDLE BRONZE AGE POTTERY CLASSES AT TELL EL-DAB`A

	MB IIA				MB IIA-B				MB IIB				MB IIB-C				MB IIC				?			
	SP	Nile	Other	?	SP	Nile	Other	?	SP	Nile	Other	?	SP	Nile	Other	?	SP	Nile	Other	?	SP	Nile	Other	?
AMPHORAS	55	1	1	22	51	1	0	11	50	2	0	12	29	5	0	6	7	3	0	3	6	0	2	3
POLISHED	10	6	2	8	18	21	2	12	15	32	0	16	0	5	0	0	0	3	1	0	1	1	0	0
PAINTED	10	2	0	13	4	1	0	1	1	7	0	5	0	5	1	2	0	0	0	0	1	1	0	1
YAHUDIYEH	4	3	0	2	3	2	0	1	1	11	0	0	0	8	0	0	0	0	0	0	1	1	0	1
MISCELL.	0	12	5	5	0	8	1	0	0	13	2	1	0	1	1	1	1	5	1	2	0	1	0	0
TOTAL	77	24	8	50	77	33	3	25	67	65	2	34	29	24	2	9	8	11	2	5	10	4	2	5

SP = Southern Palestinian red loess clay
Nile = Nile alluvial clay
MISCELL. = Miscellaneous types, including Egyptian and Levantine

The 12th and 13th Dynasty town of Kahun (Illahun), excavated by Petrie (1890 and 1912), is represented by 27 pottery and mudbrick samples (JH172, JH175-JH193, JH195, JH199, JHC019, and JHC027-30), including Tell el-Yahudiyeh juglets and a zoomorphic vessel, Red Polished and Levantine Painted Ware juglets, a bowl, and numerous jars with incised marks. Except for two of the Tell el-Yahudiyeh juglets (JH180 and JH181), which are of Nile alluvial clay, and two outliers (JH176 and JH184), the various vessel types form a tight local group with Fayyum region marl clay samples (JHC020 and JHC021) collected at the site (Table 15 in Appendix 3).

The Fayyum-Maadi marl clay group (labeled FAYMARL in tables and figures) comprise samples from an Egyptian marly clay deposit, which outcrops north of the Fayyum (see Fig. 1) as the Qasr el-Sagha formation of Upper Eocene date (JH982-JH985; Said 1962: 102-103), and extends across the Nile as the contemporaneous Maadi formation shales. In addition, clays of the same type were collected at Kahun (JHC021 and JHC022) and Dahshur (JHC023).

Two samples of marl clay from Giza (JHC016 and JHC017), collected by S. Tobia of Ain Shams University in Cairo, were chemically different from the Fayyum-Maadi marl clay group.

Upper Egypt (Tables 17 and 18 in Appendix 3; also see Table 46 for unassigned samples)

Four jar body sherds (JH220 and JH532-534) from recent excavations at el-Amarna were selected by P. Rose for analysis. These specimens did not match any other samples in the database, and probably represent a local marl type. A larger group of samples is needed to substantiate this finding.

A combined NAA and organic contents study of wine, meat, and other ostraca from the palace of Amenhotep III (Malkata), Deir el-Medineh, and the Valley of the Kings in western Thebes (McGovern 1997a) has established the probable local marl clay chemical profile (labeled THEBES in tables and figures).

A marl clay sample (JHC018) from Ballas, about 50 kms north of Thebes, had a different chemistry.

Sudan (Table 46)

Two body sherds from Kerma (JHC026 and JHC030) and one from Gebel Barkal (JHC031), unprovenienced and undated, did not match any other sample in the database, and are insufficient to define a local group.

Gaza group of Middle Bronze Age Sites (Southern Palestine) (Tables 19-25 in Appendix 3; also see Table 46)

Forty-nine MB pottery samples from the so-called "Gaza group of Middle Bronze Age sites"--a number of relatively large city-states centered on Gaza, extending from Tell el-Far`ah South (labeled FAR`AH in tables and figures) to Ashkelon (ASHKEL) along the coastal plain, and also including Tell el-`Ajjul, Tell Jemmeh, Tel Haror, and Tell Beit Mirsim (BEITMIR) and Lachish farther inland (Fig. 1)--form a tight chemical group with nine samples defining the red loess clay near Gaza itself (Table 24 in Appendix 3; Brooks, et al. 1974).

Sampling of sufficiently large numbers of MB pottery vessels from most of the major sites in the Gaza region has enabled a series of local chemical groups to be defined, all of which are very close to one another in MED and MDP space. Tell Haror (Tell Abu Hureiri) on the eastern periphery of the group, however, is represented by only three specimens: a cooking pot, jar, and bowl body sherd of probable MB date (JH149, JH150, and JH153, respectively). Only JH149 definitely belongs to the larger Gaza region group.

The 20 MB specimens (JH200-JH219) from Lachish (Tufnell 1958), including flat-bottomed, hole-mouth and upright-rim cooking pots as well as Canaanite Jars, probably all belong to the Gaza regional group. Five samples, however, were not as strongly supported by some statistical criteria, and were eliminated, thus forming a tight local group.

Of the 12 MB specimens (JH221-JH232) from Tell el-Far`ah South (Petrie 1930; also see Duncan 1930), including a range of bowls, jugs, juglets, and a Canaanite Jar, five are tight members of a local group. Other samples are very likely members of the larger Gaza regional group.

A similar range of pottery types as at other Gaza region sites was chosen for analysis from Tell el-`Ajjul (Petrie 1931-1934; also see Duncan 1930). Although pottery from inland Southern Palestinian sites generally appears to date to MB IIB or MB IIC, the Courtyard Cemetery at `Ajjul belongs to MB IIA (Tufnell 1962). Unexplainably, whereas 11 specimens (JH236-JH236, JH239-JH241, and JH243-JH247) of probable MB IIB-C date, including bowls, jugs and juglets, formed a tight chemical cluster, two Canaanite Jars and a jug from the Courtyard Cemetery are of uncertain provenience. An MB II Canaanite Jar (JH233) and two cylindrical juglets (JH237 and JH238) are closer in MED space and possibly produced locally.

The 21 Tell Beit Mirsim pottery specimens (JHBM01-21) are of uncertain provenience, having been collected as a part of a salvage operation of looted tombs (except JHBM01). Typologically, they generally date to MB IIB-C and include most of the same types as those sampled at other Gaza regional sites. Although several samples were considered outliers for the purposes of forming a local group, none is very far removed in MED space, suggesting that they were made at another site of the Gaza group.

The recent excavations at Ashkelon (see Stager 1991) have reached MB levels at the site, as yet to be published. The two cooking pots and an MB IIA Canaanite Jar and Red Polished jar (PMG165-PMG166 and PMG171-PMG172),

which were analyzed, are extremely close chemically to one another and to the Tell el-`Ajjul local group and the Tell el-Dab`a group of pottery imported from the Gaza region (below).

Central Palestinian Coastal Plain (Tables 26 and 27 in Appendix 3; also see Table 46)

Tel Aphek/Antipatris, which is located to the northeast of Tel Aviv on an estuary of the Yarqon river, is of particular importance for Levantine-Egyptian connections in the MBA, because a very full corpus of pottery has been published for MB IIA (Beck 1975 and 1985). Excluding two large carinated bowls (JH626-JH627), two juglets (JH621 and JH629) and five Canaanite Jars (JH647, JH649-JH650, and JH652-JH653), which were probably imported from the Gaza region, the Aphek group is well-defined. Marginal samples, which include a range of bowls, juglets, jugs, jars, cooking pots and Levantine Painted Ware, are very likely of local origin.

Tell el-Ifshar (Tel Hefer) lies 40 kms north of Tel Aphek, on the Alexander river in the plain of Sharon (Paley and Porath 1993). Like Aphek, it has produced a diverse and rich group of MB IIA pottery, now being prepared for publication by S. M. Paley. Carinated bowls (JH560, JH570, and JH586) and a Canaanite Jar (JH563) again appear to have been imported from Southern Palestine. Excluding these, one sample (JH552) of uncertain provenience that is identified as "Qena (Egypt) ware" based on typological and fabric criteria, and marginal samples of probable local origin, a tight local group can be defined. A full range of pottery types, including bowls, juglets, jars/jugs, a Canaanite Jar, cooking pots, and Levantine Painted Ware, is represented.

Of two carinated bowls from Jaffa, one is a probable import from Southern Palestine (JH586) and the other is of uncertain provenience (JH587).

Northern Palestine (Jezreel Valley region) (Tables 28 and 29 in Appendix 3; also see Table 46)

Megiddo and Beth Shan provide well-defined local groups for the central and eastern Jezreel Valley.

Apart from one sample (JHMG06), possibly local, all the Megiddo specimens (see Guy 1938)--including bowls, juglets, jugs, jars, a Canaanite Jar and a cooking pot--cluster together. The specimens range in date from EB IV through the MBA (see Guy 1938).

The Beth Shan local group is based on 31 examples of LB IIB date (McGovern et al. 1993), and is comprised of Palestinian and Egyptianizing pottery vessels and objects. It is not known whether the same clay source was exploited during the MBA.

Central Palestinian Hill Country (Tables 30 and 31 in Appendix 3; also see Table 46)

One site in this region, el-Jib/Gibeon (Pritchard 1963), was sampled for a range of pottery types (bowls, juglets, and jugs) dating to MB IIB-C. All are very likely made of yellow limestone-derived marl clay (Moza Formation--Goren 1995 and 1996), although JH164 and JH546 are outliers of the local group.

A reference group of clays collected at Gibeon and Arub (Brooks, et al. 1974) is very chemically close to the Gibeon local group.

Southern Jordan Valley (Table 32 in Appendix 3; also see Table 46)

The Jericho local group of MB IIB-C bowls, jars, jugs, and juglets, including Polished and Tell el-Yahudiyeh varieties, were excavated by Garstang (1933 and 1934) and Kenyon (1960-1965). Whereas JHJR07, a jug, was imported from Southern Palestine, other outliers are possibly of local origin.

Eastern Dead Sea region (Table 33 in Appendix 3; also see Table 46)

The archaeological contexts of the Early Bronze (EB) material from Bab edh-Dhra`, Feifa, and Safi are not known, but possibly the Bab edh-Dhra` pottery is from the American excavations (see Rast and Schaub 1981 and Schaub and Rast 1989) and the Feifa and Safi pottery from robbed-out tombs (W. E. Rast, personal communication). The bowls and jars, as well as a miniature juglet, are of standard EB Transjordanian types, and range in date throughout the period.

Several Feifa and Safi samples, principally from bowls, form a tight chemical cluster, as opposed to considerable variability among the Bab edh-Dhra` specimens. EB pottery often exhibits a greater spread of elemental concentrations for what is presumed to be local pottery than that of later periods, perhaps because of the generally higher volumetric percentages of inclusions (however, contrast the Tell el-Fukhar local group, below). Presumably, several different clays were also exploited in this region during the Early Bronze Age (EBA).

Central Transjordanian Plateau (Tables 34 and 35 in Appendix 3; also see Table 46)

Two very distinct local groups serve as reference points for this region that appears to have had relatively little sedentary occupation during the MBA. Sahab, southeast of Amman, had fairly substantial MB IIB-C architectural remains (Ibrahim 1972, 1974, and 1975a-b) from which the pottery samples derive, although their exact contexts are unknown. The Baq`ah Valley local group (McGovern, et al. 1986), representing a wide range of pottery types from LB IA through Iron IA, was made of alluvial clay

from the Wadi Umm ad-Dananir, below the LB-Roman settlement site of the same name.

Northern Transjordanian Plateau (Table 37 in Appendix 3; also see Table 46)

Tell el-Fukhar (see McGovern 1997b) in this as-yet poorly explored region has produced a large local group, comprised of range of pottery types (bowls, jugs, jars, Canaanite Jars, cooking pots, and more specialized forms), belonging to EB II-III, the LBA, early Iron Age, late Iron Age, and Hellenistic period. Alluvial clay from the Wadi Shellale, below the site, are of the same chemical composition.

Southern Coastal Lebanon (Sidon region) (Table 37 in Appendix 3; also see Table 46)

Several sites to the east of Sidon--in particular, the cemeteries of Kafer Djarra and Lebe`a in the vicinity of Ruweise--were excavated by Contenau (1920 and 1924) and Guiges (1938). The sampled pottery, which generally dates to late MB IIA and MB IIB (Gerstenblith 1983: 42-43; note JH449, an LB/early Iron Age pyxis, and JH481, an amphoriskos), most likely comes from tombs in these cemeteries, even though unspecified in Appendix 2. The MB IIA-B bowls, juglets, jugs, jars, and a Canaanite Jar show many chemical similarities. A smaller group from the Ruweise/Kafer Djarra area, however, was segregated as a tight chemical cluster with a high probability of being of local origin.

Central Coastal Lebanon (Byblos) (Table 38 in Appendix 3; also see Table 46)

Montet (1928-1929) and Dunand (1937 and 1939) excavated the very limited corpus of material that was sampled from Byblos. The pottery and objects is diverse chronologically as well as typologically. Apart from an EB IV jug imported from Southern Palestine, only the two bull's heads of probable EBA date cluster together. As a unique type at the site, they probably define a local clay source.

Northern Coastal Lebanon (Table 39 in Appendix 3; also see Table 46)

A variety of EB III-IV, LB II, and Iron II pottery--bowls, jars, and Canaanite Jars--was sampled from Tell `Arqa in the Akkar plain of the lower Nahr el-Kebir (Thalmann 1993). Their uniform chemistry suggests a local origin for the group as whole, although a smaller, tighter sub-group was defined.

Southern Inland Lebanon (Biqa`a Valley region) (Table 46 in Appendix 3)

Two surface sherds of probable MB IIA and IIB date were collected from the tell at Kamid el-Loz (see Hachmann 1983) and analyzed. They were chemically very different from one another and from other samples in the databank. Therefore, a local group could not be established.

Southern Coastal Syria (Table 40 in Appendix 3; also see Table 46)

A group of MB bowls and jars from Tell Kazel (Dunand and Saliby 1957; Dunand, et al. 1964; also see Badre, et al. 1990), north of the lower Nahr el-Kebir, have similar chemical compositions, pointing to a local origin. A smaller group of five samples provides the local chemical profile. Archaeological contextual information was not available.

Northern Coastal Syria (Tables 42 and 43 in Appendix 3; also see Table 46)

Unfortunately, virtually no proveniences are provided for the large pottery corpora of bowls, Polished, Painted and Tell el-Yahudiyeh juglets, jars/jugs, Canaanite Jars, cooking pots, and other types from Ras Shamra/Ugarit and Tell Ibn Hani (see Schaeffer 1949 and Bounni, et al. 1981, respectively). Although a detailed inventory and illustrations are lacking, one must assume that MB pottery was usually sampled, in accord with the brief descriptions (e.g., carinated bowl) and the purpose of the study. Some additional Ras Shamra material (JHRS01-JHRS16), however, was collected from discarded sherds at the site and is more broadly dated to the MBA-LBA. One group of Tell Ibn Hani pottery (JH946-JH966) came from the LB excavated areas at the site, presumably of the same date. Fragments from Hellenistic amphoras (JH967-JH975) comprise a second Ibn Hani group.

While the Ras Shamra corpus shows more chemical heterogeneity than that of Tell Ibn Hani, local groups could be defined which most likely reflect a different clay deposits having been exploited in the MBA at Ras Shamra and in the LBA at Tell Ibn Hani. A larger database for the northern Levant is needed to determine the origin(s) of the outliers of the local groups. In general, none of the Ras Shamra or Ibn Hani specimens are chemically comparable to material from the southern Levant and Egypt.

Central Inland Syria (Qatna-Hama region) (Table 43 in Appendix 3; also see Table 46)

Handleless jars and goblets, as well as incised designs, characterize the EB IV-MB IIA pottery from Qatna, Selimiye, Osmaniye, and the Orontes Valley region in the vicinity of Tell `As (du Mesnil du Buisson 1930, 1932, and 1935; see Gerstenblith 1983: 46-47). The "local group" covers an approximately 50 km stretch along the upper to middle Orontes River, and may reflect either a uniform clay chemistry in this geographic area or inter-site trading.

North-Central Inland Syria (Table 44 in Appendix 3; also see Table 46)

The Tell Mardikh/Ebla local group has recently been corroborated by a more extensive study of representative EB IVA pottery types from known contexts of Royal

Palace G (McGovern Forthcoming; also see Nigro 1996). Bowls and jars/jugs of both EB IVA and MB IIB-C date comprise the local group referred to in this volume.

Southern Inland Syria (Table 45 in Appendix 3; also see Table 46)

Mtouné is a cemetery located about 70 kms southeast of Damascus in the Suweida district of the Hauran. A large pottery group, which have been only preliminary published (see al-Maqdissi 1984 and 1988), includes Tell el-Yahudiyeh juglets and a range of other MB IIB-C types that was analyzed and determined as belonging to a well-defined local group.

Chapter II

THE CANAANITE JARS (AMPHORAS)

The Canaanite Jar is an apt designation for the Middle Bronze Age (MBA) amphora--an ovoid-shaped amphora with two handles, a rounded or slightly flattened base, and a narrow mouth--because it most likely originated in ancient Canaan, a regional name that was closely associated with the Syro-Palestinian coast (Speiser 1936; Landsberger 1967). Indeed, the earliest examples of the type occur there, and their antecedents can be traced back to the handleless jars of the Early Bronze Age in the same region (Parr 1973). The Canaanite Jar, with a capacity of approximately 30 l, became the liquid container and the export pottery vessel *par excellence* for Mediterranean sea trade. In the Late Bronze Age (ca. 1550-1200 B.C.), the shape of the MB amphora was refined into a piriform-shaped jar with a pointed or knobbed base and a narrow mouth, which could be effectively sealed with a clay stopper (Amiran 1969: 102-105, 138-44; Wood 1987; Hope 1989; Leonard 1995; McGovern 1997a) was used to transport an enormous variety of goods within Egypt and throughout the Eastern Mediterranean. With relatively minor modifications of shape, it continued to perform these functions for thousands of years, through Greek and Roman times (Grace 1956; Koehler 1994) and up until the Islamic period.

The Canaanite Jar was well-suited to transporting liquid goods by sea: its curved base was stronger than a flat base and served as a "third handle" for loading and unloading from ships; its overall shape enabled efficient storage in a ship's hold by intercalating layers of amphoras (compare the Late Bronze merchantship found at Uluburun, off the coast of southern Turkey--Pulak 1988 and Bass, et al. 1989); and its volumetric capacity of about 30 l was close to the maximum that could be handled by a single man. As storage containers, amphoras could be rested up against a wall or supported in hole or a special support.

1. Stylistic and Technological Overview

A total of 290 Canaanite Jars from Tell el-Dab`a were included in the Neutron Activation Analysis (NAA) program. The MB IIA and MB IIB sub-periods are best represented in the corpus (Table 5). The number of specimens for MB IIA-B, IIB-C, and IIC is less, especially for the latter sub-period. All the sub-periods are approximately of the same duration, and research questions related to the development of Tell el-Dab`a in MB IIA and its dramatic expansion during MB IIB and the Hyksos period proper dictated sample selection.

Since whole or nearly whole vessels comprise a sizeable proportion of this large corpus, we can draw relatively good inferences about both stylistic and compositional changes throughout the period. It should be stressed, however, that any conclusions presented here are preliminary pending fuller pottery publications (now in progress by D. Aston and A. Pape).

The Canaanite Jars of Tell el-Dab`a are remarkably standardized in their size, overall shape, rim and base profiles, fabrics (see below), and other features, attesting to a high level of craftsmanship. The jars were coil-built, with each coil having a width of about 2-4 cm. after it had been overlapped with its neighboring coil by turning on a wheel (also see Arnold 1993). The exterior sidewalls were roughly smoothed. The base, which was initially a slab of clay, was scraped after drying to produce a flat or, more often, a slightly convex surface. The rim was most often made by folding the uppermost coil to the exterior, creating bulges and ridges that are most diagnostic for discriminating the styles of the sub-periods. Handles were added after drying, and various incised lines and marks, seal and thumb impressions, simple painted geometric designs, and patterned combing completed the production process of some of the vessels.

TABLE 5
TYPOLOGY OF MIDDLE BRONZE CANAANITE JARS (AMPHORAS) AT TELL EL-DAB`A*

Description	Type	MB IIA	MB IIA-B	MB IIB	MB IIB-C	MB IIC	Later or ?
Rounded rim	JI.11	8	4	7	2	1	0
Flattened rim	JI.12	2	1	0	0	0	0
Tapered rim	JI.13	1	0	0	0	0	0
Ext. rounded rim	JI.21	7	4	9	1	1	0
Ext. flattened rim	JI.22	6	0	0	0	0	0
Ext. tapered rim	JI.23	3	1	0	0	1	0
Int. rounded rim	JI.31	1	0	0	0	0	1
Int. tapered rim	JI.33	0	0	1	0	0	0
Int., ext. rounded rim	JI.41	2	0	0	0	0	0
Int., ext. flattened rim	JI.42	3	0	1	0	0	0
Int., ext. tapered rim	JI.43	0	0	1	0	0	0
Flat base	JI.0.11	5	3	5	5	1	1
Convex base	JI.0.13	23	23	17	16	1	1

*Canaanite Jars included in the follow-up NAA study (Figs. 117-120.passim), as well as Painted examples in the main study, are omitted from the tabulation.

Closer examination of the stylistic features of the Canaanite Jars leads to the conclusions in the sub-sections that follow.

Height

The standard height of a Canaanite Jar at Tell el-Dab`a, where it can be measured, ranges between 50 and 60 cm throughout the MBA. In MB IIB and thereafter, some examples are in the 60-70 cm range (note JH078, MB IIB, a particularly large example). Only one amphora (JH082, MB IIB-C) had a documented height less than 50 cm.

Dimensions and shapes

The ratio of the maximum width to height of the vessel is between 0.45 and 0.55, which can be defined as slender-bodied (Arnold 1988). Beginning in MB IIA-B, a more bulbous form with a ratio exceeding 0.55 makes its appearance (e.g., JH711). Many such forms are evident in the MB IIB group, even where the rim is lacking. MB IIB-C (e.g., JH898, and the small amphora, JH082) and MB IIC examples follow the same pattern.

The overall shape of the Tell el-Dab`a Canaanite Jars is piriform, with a rounded shoulder tapering gradually to a rounded or flat base. While the normative form continues to be the piriform in later MB sub-periods, baggier shapes, in which the maximum diameter is below the middle of the body, are attested from MB IIA-B onwards, e.g., JH711 (MB IIA-B), JH051 (MB IIB), and JH025 (MB IIB-C). A more symmetical shape, in which the maximum diameter is at or near the middle of the body, is occasionally attested throughout the MBA: JH268 (MB IIA), JH078 (MB IIB), and JH012 (MB IIB-C).

Handles

Single-stranded handles, which are rounded or elliptical in cross-section, are placed about two-thirds of the way up the vessel, the upper handle attachment usually being at the point of maximum width ("the shoulder"). In later MB sub-periods, some baggy-shaped amphoras (e.g., JH025, MB IIB-C) look lopsided and clumsy, because their handles, although still two-thirds of the way up the body, are placed above the maximum width.

In sideview, the Canaanite Jar handles of MB IIA are semicircular or arched upwards in a triangular shape. Less care in their formation is clearly evident by MB IIB, some examples being more irregular in shape (e.g., JH014) or jutting out (JH090 and JH017). The size of the handle can also be inappropriate for the size of the vessel (JH023), and a pair of handles on one amphora are assymetrically positioned (e.g., JH054).

Necks

Necks are generally 4-6 cm high and flare outwards, although somewhat taller, more erect stances occur (e.g., JH067 [MB IIA], JH657 [Pl. 2b, MB IIA-B]) and can even be inturned later in the MBA (e.g., JH980 [Pl. 3a, MB IIB-C]).

Rim profiles

The rim profiles are most distinctive, as mentioned above. In MB IIA, the variety that sets the stage for what follows and is best represented in the corpus (Table 5) is a plain rounded, everted rim (type Jl.11, *apud* the typology of Cole 1984: table 5, pls. 32-44). Related to this type, an exteriorly developed and ridged rim with either a rounded edge (Jl.21) or flattened top (Jl.22) accounts for 57% of the MB IIA group (Table 5). This so-called elongated folded rim (Beck 1985: 186) continues to be the most common type in the remainder of the MBA, although the exteriorly developed rim profile is exclusively rounded in succeeding MB sub-periods. Some examples are slightly inturned (e.g., JH263 [MB IIA], JH026 [MB IIB], and JH809 [MB IIC]); one MB IIA-B rim--JH257--can be described as outturned. A simple flattened rim also occurs in MB IIA-B (JH770), but is not represented later in the NAA corpus.

Two plain rim types are attested only in early MB IIA level d1 of area FI at Tell el-Dab`a: (a) a variety that is flattened on top and tapered exteriorly (Jl.12--JH119 and JH121) and (b) a rounded, tapered variety that is turned back on itself towards the sidewall (Jl.13--JH122). Exteriorly profiled rims are also tapered in MB IIA and later (Jl.23--e.g., JH782 [MB IIA], JH138 [MB IIA-B], and JH810 [MB IIC]).

Rims that are solely developed interiorly are extremely rare in the NAA corpus. Single examples of a rounded variety (Jl.31--JH846) and a tapered variety (Jl.33--JH787) occur in MB IIA and IIB, respectively.

Interiorally and exteriorally profiled rims, which are rounded (Jl.41--cf. JH067 and JH260) or flattened on top (Jl.42--JH089 [Pl. 1a], JH261, and JH842), occur in MB IIA. Comparable varieties are attested in MB IIB, either flattened (JH011=904, a probable pithos that was included in the Canaanite Jar corpus) or tapered (Jl.43--, JH802).

Bases

In contrast to rim varieties, bases are essentially non-diagnostic. Plain convex profiles (Jl.0.13) predominate over plain flat bases by as much as a 7:1 ratio in MB IIA-B (Table 5), and this pattern prevails in other MB sub-periods except MB IIC (for which the sample size is too small). In fact, a continuum of shapes exists between what is here denoted flat and convex; unless a base is truly flat, it has been assigned to the convex group. Whether convex or flat, the base diameter is usually 5-7 cm, although examples as large as 8-9 cm occur in the corpus (e.g., JH055 [MB IIA], JH047 [MB IIA-B], and JH091 [MB IIB-C]). Some convex examples are more rounded (e.g., JH711 [MB IIA-B], JH258 [MB IIB], and JH024=JH692 [MB IIB-C]) or pointed (e.g., JH089, Pl. 1a, MB IIA], JH028 [MB IIA-B], JH026 [MB IIB], JH054 [MB IIB-C], and JH068 [MB IIC]).

Incised marks, thumb and seal/scarab impressions, and other decorative details

Decorative and/or utilitarian details are limited to neck ridges, incised horizontal lines and marks (23 examples), combing (24 examples), thumb and seal/scarab impressions on handles (6 examples), and simple geometric red painted designs (4 examples, which are also discussed in Chapter 4). These features are relatively uncommon, and rarely occur together on the same vessel.

Only one instance of a distinct ridge where the neck meets the shoulder (JH657, Pl. 2b, MB IIA-B) is documented in the corpus. Slight bulges in the same region (e.g., JH129, MB IIA, and JH094, Pl. 1d, MB IIA-B) are suggestive of ridges, and multiple ridges on elongated rims (e.g., JH799, MB IIA-B, and JH810, MB IIC) are possibly developments in the direction of more pronounced neck ridges.

Incised horizontal lines, singly and in pairs, are at the same level as the upper handle attachment, and were evidently made before the handles were attached since they are usually covered over in the handle area: cf. JH066 and JH263, MB IIA, JH612 and JH657 (Pl. 2b, MB IIA-B), JH051 (MB IIB), and JH082 (MB IIB-C). One example with three incised lines (JH027) comes from an MB IIA context. Such lines might have served as guides in handle placement.

Incised geometric marks occur in all MB sub-periods except IIC. A simple X-mark (JH084, MB IIB), an X bordered by a line (JH110 and possibly JH093, MB IIA), a claw-like mark (JH703, MB IIB-C), three diagonal notches (JH700, MB IIA-B), a ladder-like design (JH611, Pl. 2a, MB IIA-B), a circle (JH262, MB IIA), and a curved line within a circle (JH033-36, MB IIA) are placed to the left of a handle on the shoulder, with the exception of JH262 (midway between the handles) and JH703 (above a handle). Two MB IIA-B examples (JH010 [Pl. 4a] and JH081) are incomplete shoulder fragments. Since such marks were made before firing, they might well have been individual potter or workshop insignia, in a period before the proto-Sinaitic script was developed (Albright 1969). The incised signs on the Canaanite Jars might also indicate certain persons or groups for whom they were intended, or signify specific goods or some other economic purpose (such as the shipment or storage of goods).

Combing of the sidewalls of the Canaanite Jars is a carry-over of Early Bronze Age pottery technology. Occurring more frequently than incised lines and marks in the present corpus, it is not correlated with other stylistic features. It can be more extensively done in horizontal and vertical zones, i.e., by "pattern-combing" (e.g., JH055 [MB IIA], JH259 [MB IIA-B), or in a more minimal and irregular fashion (e.g., JH265=266 [MB IIA], JH082 [MB IIB-C]), the latter becoming the common practice in later MB sub-periods.

The following seal/scarab and thumb impressions on the upper surface of one handle are included in the corpus:

1) JH874 (MB IIA-B): a seal/scarab impression showing a simple criss-cross geometric design.

2) JH004 (MB IIB): a probable thumb impression.

3) JH256 (Pl. 4c, MB IIB): an indecipherable seal/scarab impression.

4) JH091 (MB IIB-C): a seal/scarab impression with a hieroglyphic inscription reading "ruler [of] *shimu*." The word for "ruler" or "governor" (Eg. *h3ty-*`) is the same title as that used by the Byblian princes of the 12th and early 13th Dynasties (Lorton 1974: 64; Ward 1961: 134-35) and as that which appears on an inscribed stone bowl from the Late Bronze Age palace at Kamid el-Loz (ancient Kumidi) in the Biqa`a Valley of Lebanon (Edel 1983). *Shimu* probably refers to a city-state or region of Syria-Palestine, such as ancient Sharuhen in the Gaza region or Damascus (Bietak 1994: 22), although it might also be interpreted as the name of the prince (Bietak 1996: 60-63).

5) JH821 (Late Bronze II-Iron I): a seal/scarab impression showing a crocodile (representing the god Sebek in Egypt).

6) JH253 (Pl. 2d, undated); a seal/scarab impression showing a scarab beetle, flanked by uraei, and with the *nb*-sign below.

Seals, scarabs, even thumb imprints, are most likely marks of personal ownership. No MB IIA examples are included in the corpus, implying that this practice became more common from MB IIB through the Hyksos period when Egyptian-style scarabs and seals proliferated in Palestine.

Four red-painted specimens (also see Chapter 4), which are clearly amphoras or fragments of such (i.e., not jugs or handleless jars), have simple geometric designs. A horizontal band on the shoulder (JH043, MB IIA-B) is slightly askew and not as carefully done as part of a narrow oblique band, bordering a handle with a seal/scarab impression of five *'ankh*-signs (JH873, Pl. 4b, MB IIA-B). A metope-like design of horizontal and vertical bands occurs on the shoulder of an MB IIA example (JH128). A large bisected circular-like design, which is set somewhat off-center between the handles, appears on MB IIA and IIA-B Canaanite Jars (JH137 and JH073). Although the latter two examples differ in size and are rather carelessly rendered, it should be noted that the design of each is characterized by an upward extension on the left side. Possibly, this motif is related to the incised line within a circle or the three adjacent diagonal notches that appear on other Canaanite Jars in the corpus (above). As in the case of the incised marks and thumb and seal/scarab impressions near or on handles, this painted motif probably had some kind of social or economic significance.

Pottery fabrics

The pottery fabrics of the Canaanite Jars, as well as the other groups of imported and locally made pottery found at Tell el-Dab`a, have been classified macroscopically (up to 10X magnification) according to the so-called Vienna System (Nordström 1986; Nordström and Bourriau 1993). Special criteria and unique alphanumeric categories have been developed for the Tell el-Dab`a pottery (Bietak 1991: appendix, pp. 317-33). The NAA results have provided a partial check on the classification (below), but petrographic analysis is needed to define better the categories.

Nearly all of the Canaanite Jars in the NAA corpus belong to imported type IV. IV-2b-c, denoting a reddish-yellow paste color with small to moderate amounts (1-10%) of fine to medium-sized calcite inclusions (0.5-2 mm in diameter), are the most common sub-types. A reddish paste color (IV-1) is two to three times more frequent than a yellowish-white paste color (IV-3), both being in other respects similar to IV-2. Considerable amounts (>10%) of large calcite particles (>2 mm), viz. sub-type IV-1-3-d, are occasionally attested for the three paste colors, but no example has minor amounts of fine constituents (i.e., belongs to sub-types IV-1-3-a).

Only six Canaanite Jars of the 290 examples in the corpus were described as made of Nile alluvial clay, such as that still exploited at the Faqus pottery workshops, about 10 km south of Tell el-Dab`a (see Chapter 1). Sub-type I-b2 (Nile B2 in the Vienna System--JH810, MB IIC) is a reddish-brown paste, with a considerable amount of quartz inclusions (ranging in size up to 1 mm) and fine to medium-sized organic matter (up to 3 mm) that probably derives from animal dung. Sub-type I-c (Nile C in the Vienna System--JH082 and JH762, MB IIB-C), which is similar in other respects to I-b2, has large straw voids (sometimes exceeding 7 mm in length). Sub-type I-e3 (Nile E in the Vienna System), a reddish-brown paste with considerable amounts of large sand and grog inclusions (>1 mm) is represented by three examples: JH040 (MB IIA), JH111 (MB IIA-B), and JH062 (MB IIB). Three additional examples (JH608 and JH798, MB IIA) and JH777 (MB IIB) were queried as possible I-b or I-e fabrics.

Constituting an even smaller percentage of the total Canaanite Jar corpus, three vessels were assigned to Egyptian marl fabric sub-types II-a, II-c, and II-f (Marls A3, C, and F, respectively, in the Vienna System). Marl II-a (JH736, MB IIA) and II-c (JH790, MB IIA) are usually light reddish or grayish in color, and contain moderate amounts of fine calcite that can be decomposed, creating irregular voids in II-a fabrics and elongated pores with vitrified streaks in II-c fabrics. II-f fabrics (JH731, MB IIA-B), by contrast, are reddish-yellowish, and have no visible calcite inclusions and relatively more quartz and other inclusions. Recent NAA analyses suggest that both II-a and II-f fabrics of early New Kingdom date derive from Upper Egyptian marl clays (see Chapter 6). According to the NAA analyses (below), marl II-c derives from the Upper Eocene clay deposit that extends from north of the Fayyum oasis in a southeast direction towards Maadi on the east bank of the Nile; JH790, however, is of Southern Palestinian origin.

2. Neutron Activation Analysis Results

As explained in Chapter 1, statistical evaluation of NAA compositional data using multivariate techniques is an extremely powerful technique, assuming that one has large numbers of samples assigned to local groups which are tightly controlled in time and space. These assumptions are best met by the Canaanite Jars in the data base, of which many examples from Tell el-Dab`a and sites throughout the Levant were tested.

The NAA results present a remarkably consistent picture for the origin of the Canaanite Jars (Table 4, Chapter 1). Nearly three-quarters of the corpus is made of red loess clay which is characteristic of an approximately 3000 km^2 area along the southern littoral of Palestine (Fig. 1). This region was intensively inhabited during the MBA at many sites, conveniently described as the "Gaza group of Middle Bronze Age sites," including Gaza itself (largely unexcavated), Tell el-`Ajjul (identified as ancient Sharuhen), Ashkelon, Tell el-Far`ah South, Lachish, Tel Haror, and other sites.

The relative percentage of Canaanite Jars coming from Southern Palestine remains very constant in each MB sub-period, ranging between 70% and 81%, up until MB IIC when it drops to 54% (Fig. 22). Because of the homogeneity of the red loess clay in this region, it is extremely difficult to isolate specific sites or workshops that produced the Canaanite Jars which eventually made their way to Tell el-Dab`a. In mean Euclidean distance (MED) space, it may well be significant that the locally defined groups at Tell el-`Ajjul and Ashkelon are especially close to many of the Tell el-Dab`a specimens (see Chapter 1).

The only other region that is consistently represented in the NAA corpus, albeit in a minor fashion, is Tell el-Dab`a itself. Already in MB IIA stratum c of area FI, a vessel (JH040, not illustrated), which had already been identified as made of Nile alluvial clay by macroscopic examination (above), was confirmed to be such by NAA. A few more Canaanite Jars made of Nile alluvial clay occur in MB IIA-B and IIB (Table 4), with a noticeable increase in the

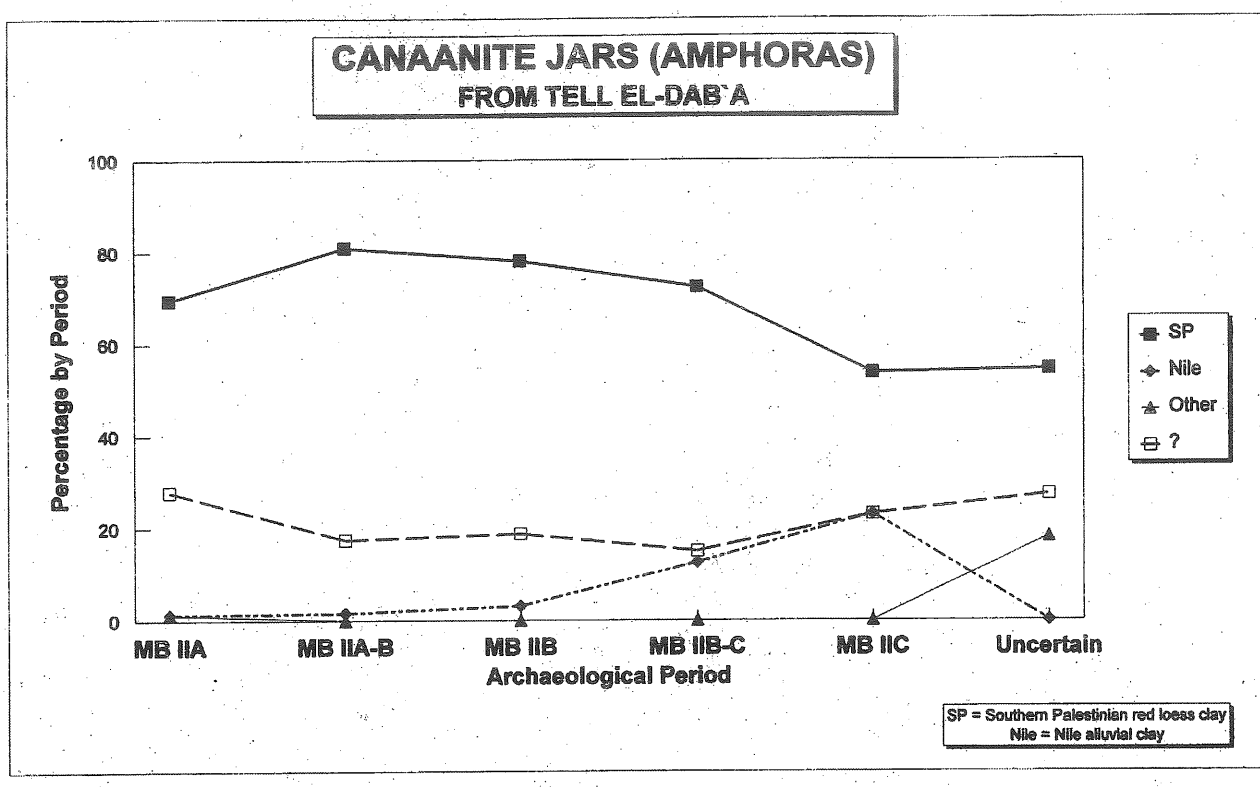

Fig. 22: Relative percentage of Canaanite Jars made of Southern Palestinian red loess, Nile alluvial, and other clays at Tell el-Dab`a, for each sub-period of the Middle Bronze Age. Samples with uncertain proveniences (?) are also shown.

relative percentages for MB IIB-C (13%) and IIC (23%), at the same time that the numbers of imported Canaanite Jars from Southern Palestine are declining (Fig. 22). The Nile alluvial clay group, including the Canaanite Jars as well as other pottery groups, is chemically and statistically tight, implying that a clay source close to Tell el-Dab`a was being exploited to make the amphoras. If Canaanite Jars were coming from other parts of Egypt, one would expect a much less well-defined group, given the inhomogeneity of Nile alluvial clays.

A single amphora (0.3% of the Canaanite Jar corpus) definitely derives from an area outside of Southern Palestine or the Nile Delta, viz., JH120, a simple flat base fragment excavated in MB IIA stratum d1 of area FI, which originates from the region of Tell `Arqa, a site in northern Lebanon (Thalmann 1978a, 1978b, and 1993);

Because of the very stringent requirements for assigning samples to specific areas or sites, Canaanite Jars of questionable provenience need to be examined more closely for any light they can shed on extra- or intra-Egyptian connections. It will be noted in Table 4 of Chapter 1 that relatively more Canaanite Jars of questionable provenience occur in MB IIA levels at Tell el-Dab`a than in subsequent MB sub-periods, all of which are of approximately the same duration: 28% (MB IIA), 17% (MB IIA-B), 19% (MB IIB), 15% (MB IIB-C), and 23% (MB IIC).

More than two-thirds of the questionable MB IIA Canaanite Jars--a total of 16 examples--were recovered from early MB IIA strata d1 and d2 of area FI. Five of the latter are "possibly" from Southern Palestine, including one (JH121) which is most similar chemically to an Ebla specimen (MED 0.083) that is, unfortunately, also of questionable origin (i.e., it is too distant from the locally defined Ebla group in MED space to be assigned to this group). Samples are "possibly" from a region if they fall within an MED distance of 0.08-0.10 of the defined regional group(s). Another questionable Canaanite Jar (JH122) is possibly from the region of Kamid el-Loz in the inland Biqa`a Valley of Lebanon (MED 0.095). Ten examples lack any clues to their origins. By contrast, only 12% of the Canaanite Jars from late MB IIA strata c and G in areas FI and AII, respectively, have uncertain proveniences--three possibly having been imported from Southern Palestine (JH089 [Pl. 1a], JH110, and JH140, one (JH137) possibly coming from the Sidon region along the southern Lebanese coast (MED 0.081), and four lacking any chemical match.

A case might be made that relatively more Canaanite Jars from early MB IIA levels at Tell el-Dab`a are of uncertain provenience, because they derive from sites or regions of Lebanon and Syria that are not well represented in the NAA data bank. It must be appreciated, however, that statistically some samples with questionable proveniences are always to be expected. Moreover, the standard deviations and variances in the oxides of the fifteen chemical elements used in the Euclidean and Mahalanobis distance calculations reflect natural variability in clay beds, clay preparation by ancient potters, and the analytical

method itself. If less stringent requirements were used in establishing definite and possible proveniences of samples, then there would be fewer questionable proveniences but also less coherent reference groups and more misassignments of individual specimens.

The caution that needs to be exercised in interpreting the statistical results for the early MB IIA Canaanite Jars is highlighted by a recent follow-up NAA study that were specifically selected by M. Bietak because of their early MB date and the probability that they were imported from other Levantine regions outside of Southern Palestine. The twenty additional MB IIA Canaanite Jars of this follow-up group are comparable in type, fabric, and other features to the larger Canaanite Jar corpus. Thirteen of these specimens were excavated from strata d1 and d2 in area FI, and seven of them could be assigned to the Southern Palestinian group, in addition to one example being made of Fayyum-Maadi marl clay and two examples lacking any provenience. Clearly, the relative percentage of Canaanite Jars from strata d1-d2 with questionable origins in the follow-up study (20%) is much less than that for the larger corpus (70%), and accords with the percentages of Canaanite Jars with uncertain proveniences dating to other sub-periods of the MBA. As a final note on this follow-up NAA study, of five additional Canaanite Jars from late MB IIA strata c-d1 in area FI, three were definitely from Southern Palestine and two were possibly from this region; a single example from strata G-H in area AII was of Southern Palestinian origin.

Seven MB IIA samples from Ashkelon were also analyzed, because this important southern Palestinian coastal site was poorly represented in the data bank. Of these samples, four examples (two Canaanite Jars, a Polished jar/jug, and a handmade cooking pot) fell squarely into the southern Palestinian group (see Appendix 2 and Table 23, Appendix 3), as might be expected from Ashkelon's geographic position, a short distance north of Gaza. A Tell el-Yahudiyeh example (PMG159, not published here) from Ashkelon belongs to the Egyptian Nile alluvial clay group defined at Tell el-Dab`a, and was therefore very likely an import into Ashkelon from Tell el-Dab`a. The remaining two samples (PMG163 and PMG179, not published here)--both Canaanite Jars--were of uncertain provenience. The close correspondence of the Ashkelon results with those of the follow-up Dab`a study serves to reinforce the main conclusions already reached.

The importation pattern of Canaanite Jars, apparently once having been established in MB IIA, continues along much the same lines in succeeding MB sub-periods. The vast majority of the specimens come from Southern Palestine, with the occasional possible import from the Fayyum-Maadi region, Lebanon or Syria, and the number of amphoras made of Nile alluvial clay increasing somewhat towards the end of the period.

As might be anticipated for such a relatively high percentage of MB IIA Canaanite Jars coming from Southern Palestine, almost all the rim and base types and other stylistic and technological features outlined above, are documented for this NAA group. Except for one Canaanite Jar with more elaborate horizontal and vertical combing (JH055), which is of uncertain provenience (cf. MB IIA-B JH075, JH114, and JH259, of possible Southern Palestinian, Southern Palestinian, and uncertain origins, respectively), all examples with incised lines and marks are definitely from Southern Palestine.

All the Canaanite Jars postdating MB IIA with incised lines and marks come from Southern Palestine; one possible exception (JH084, MB IIB) is closest to the Southern Palestinian chemical profile and a sample from the Sidon region of southern Lebanon which is itself an import from Southern Palestine. An MB IIA painted Canaanite Jar (JH137), referred to above, possibly represents trade in the opposite direction.

All the MB examples with seal/scarab impressions on the upper handle are also from Southern Palestine; an Late Bronze II-Iron I specimen (JH821) is possibly from Southern Palestine. Particular note should be taken of the fact that the example with the seal/scarab impression reading "ruler [of] *shimu*" (JH091, MB IIB-C) is made of Southern Palestinian red loess clay. Two painted MB IIA-B Canaanite Jars, one with a seal/scarab impression on the upper handle (Pl. 4b), were made in Southern Palestine (see above).

A non-descript single-stranded handle (JH751, MB IIA-B) is possibly from the central Orontes Valley of inland Syria, south of Ebla. Two Canaanite Jars of questionable provenience--JH079 (MB IIB) and JH806 (MB IIC)--are related both to the Southern Palestinian chemical profile and possible imported or locally manufactured pottery from the site of Tel Ifshar in the Plain of Sharon (mid-coastal Palestine); the statistical results are equivocal for JH079, but point in the direction of a Southern Palestinian origin for JH806. An example with an unusual tapered rim profile (JH787, MB IIB) possibly comes from Tell Ibn Hani, along the northern coast of Syria.

One of the painted Canaanite Jars (JH137, MB IIA) is possibly from the Sidon region, along the coast of southern Lebanon. Intriguingly, its design is nearly identical to that of a later example (JH073, MB IIA-B), which was imported from Southern Palestine.

The flat Canaanite Jar base from northern coastal Lebanon (JH120), dating to MB IIA, is not distinctive enough to draw any further inferences. It is, however, of interest that the possible southern inland Lebanon specimen (JH122, MB IIA) is the unique tapered rim type that is turned back on itself. Of the other unusual, long tapered and flattened MB IIA rims (JH119 and JH121; also cf. JH123), one is of questionable provenience and the other possibly originated from Southern Palestine or the Tell Mardikh/Ebla region. Another Canaanite Jar base (JH113, MB IIA-B), which is rounded, is also possibly related to the locally defined Tell Mardikh/Ebla group.

Canaanite Jars made of Nile alluvial clay, probably local to Tell el-Dab`a, do not differ stylistically or technologically from their imported counterparts. One bulbous example (JH082) belongs to a period (MB IIB-C) when variations in size and shape were more frequent. JH767, which is not illustrated and has a poorly defined excavation context, possibly provides evidence for the production of Syro-Palestinian type amphoras in the Fayyum-Maadi region and for their limited exportation to the Nile Delta as early as MB IIA. A Canaanite Jar of MB IIA-B date (JH013) is of equivocal origin, having been imported either from Southern Palestine or the Fayyum-Maadi region. Similar geological episodes, related to incursions of the Mediterranean Sea, or statistical variation may account for this isolated anomaly in the NAA corpus (see Chapter 1). The existence of such anomalies in this NAA study should alert the reader to the tentativeness of some of the questionable provenience assignments.

A comparison of the results from the macroscopic fabric observations (above) and the NAA analyses is instructive. There is excellent agreement for the imported (type IV) and Nile alluvial fabrics (type I). One example (JH849, MB IIA) that was classified as either belonging to type IV or type VI (Cypriot) was confirmed by NAA as being from Southern Palestine. Queried examples of sub-types I-b (JH608, MB IIA) and I-c (JH777, MB IIB) are definitely from Southern Palestine. A disparity in the results, however, emerges for the Egyptian marl clays (type II): two MB IIA Canaanite Jars (JH736 and JH790), which were classified as II-a and II-c, are possibly from Upper Egypt and definitely from Southern Palestine, respectively. Another example (JH731, not illustrated, MB IIA-B), assigned to sub-type II-f, was queried as possibly of type IV; it indeed belongs to IV, having been imported from Southern Palestine (see Chapter 6, for further discussion of marl sub-types II-a and II-f).

3. Archaeological Contexts and Uses

Although this volume cannot provide the detailed rationale for interpreting the archaeological contexts and uses of specific Canaanite Jars, differences in the pottery repertoires of burials and residences, in particular, have long been recognized. A preliminary contextual analysis also enables one to assess the representativeness of the NAA corpus. It should be stressed, based on the NAA results (above) indicating that most of the Canaanite Jars were imported, that the primary function of these vessels was probably for the importation of goods. It is doubtful that amphoras were transported as empty containers, since they could be filled at the same time with desirable commodities from the Levant (e.g., wine, olive oil, and tree resins; see Chapter 6). On the other hand, Nile alluvial clays are not suitable for making dense impermeable fabrics, which make the best amphoras, and there is no known marl clay source in the Delta (on the Nile alluvial clay composition of the Pleistocene "turtle-backs," see Arnold 1981: 182, nn. 79-82). While some amphoras might have been disposed of, many probably continued to serve other purposes.

As already pointed out (see Chapter 1 and Table 1), the majority of the Canaanite Jars were recovered from residential and palace contexts. The palace in area FI is represented by 18 examples, all dated to MB IIA (stratum d1). Eight examples were recovered from a refuse pit in square l/20, pl. 2-3 (JH119-JH125), and included an import from Tell `Arqa in inland southern Lebanon (JH120), together with unique rim types from vessels possibly imported from the Kamid el-Loz in the same region of Lebanon (JH122) and Tell Mardikh/Ebla in inland Syria (JH121). The same pit also yielded a Red Polished globular bowl (JH879; Chapter 3) and two flat-bottomed cooking pots (JH126 and JH127; Chapter 5).

Intact Canaanite Jars were secondarily employed to store a variety of commodities, probably including water (see the introductory section, above, and Chapter 6). Large groups of vessels sometimes occur together, as, for example, the five Canaanite Jars (JH022, JH039, JH055, JH130, and JH131) found in a room that most likely served as a magazine in square n/15 of area AII (stratum G, MB IIA). Ten Canaanite Jars of Southern Palestinian origin (JH045, JH705, JH708-JH710, and JH712-JH716) came from a residence in square k/24, pl. 2 in area FI (stratum b3, MB IIA-B). Groups of two or three complete Canaanite Jars from the same domestic context are fairly common in the NAA corpus.

Some Canaanite Jars were found below the floors of residences, where they had been used to bury infants. The small bones of neonates easily disintegrate in the damp soil of Tell el-Dab`a, and these bones were not always found in the amphoras probably used for this purpose.

Canaanite Jars were often placed in tombs in all sub-periods of the MBA, sometimes as probable offerings in the entrance corridors to the tombs. This practice is especially well attested in MB IIA-B, e.g., JH016, JH058, JH096 and JH097, JH113 and JH138, JH139, and JH700.

4. Stylistic Interrelationships and Implications

Only very close parallels, combining a number of stylistic features and which are generally from well-stratified and well-dated contexts, are cited in the listing of typological *comparanda* below. Primary emphasis is placed on rims, which are most diagnostic and often reflect deviations from traditional practice (for an overview of technological and theoretical considerations, see McGovern 1986 and 1989, and James and McGovern 1993). Overall shape, handles, bases, and decoration (specifically, incised lines, patterned combing, and neck ridging) of Canaanite Jars are so uniform throughout Syria-Palestine that they are non-discriminative.

As can be inferred from the listing, sites along the Levantine littoral from the Sinai northwards to the Byblos region provide the closest stylistic parallels for the Canaanite Jars from Tell el-Dab`a that are included in the NAA corpus. Very rarely and after MB IIA, sites farther inland (e.g., Jericho, Shechem, and Tell Far`ah North)

enter the picture. Coastal and inland Syrian sites are noticeably infrequent in the listing, although the available, very limited publications were culled for possible parallels.

MB IIA pottery has been extremely well published and discussed by archaeologists at the Institute of Archaeology of Tel Aviv University, who excavated and surveyed a series of sites in the plain of Sharon, which extends along the coast from modern Tel Aviv to Mount Carmel--most importantly, Tel Aphek, Tel Poleg, Tel Zeror, and Tel Burga. Other excavations that fall within the northern part of this region are Tel Mevorakh and Tel Ifshar, the latter as yet unpublished but having yielded very early MB IIA material.

Pottery from many of the sites in the plain of the Sharon are typologically related (see, especially, Gophna and Beck 1981 and Beck 1985), and provide numerous parallels for the Tell el-Dab`a Canaanite Jars. According to Beck's typology, the elongated folded rim often lacks the exterior ridge in early MB IIA, whereas the ridged variety predominates thereafter (Phases 2-4 at Tel Aphek). The unridged variety is often triangularly-sectioned (Kochavi, et al. 1979: 131), but can also be exteriorly rounded like the Dab`a Jl.21 type. Since ridged and/or rounded rim varieties occur throughout the MBA sequence at Tell el-Dab`a, however, no chronological conclusions can be drawn. One might argue that the MB IIA varieties are more out-splayed (cf. Beck 1985: 194), but exceptions exist (JH264 [Pl. 2d]).

The so-called moulded rim, which is squarish in cross-section, makes its appearance in the mid-MB IIA phase at the plain of Sharon sites. At Tell el-Dab`a, it is represented by JH011=JH904 and JH802, dating to MB IIB. Indeed, as indicated by the popularity of jar types Jl.41-.43 at Shechem (cf. Cole 1984: pls. 34-36), an interiorly and exteriorly elaborated amphora rim reached its *floruit* in MB IIB Palestine.

A simpler MB IIA variety, which is related to this more elaborated amphora rim and may or may not be flattened on top ("squared off"), is unusual in having an exterior edge that droops down or swirls back towards the sidewall (compare JH119, JH121 and JH122), rather than being pressed against the exterior sidewall. The NAA results (above) indicate that this variety derives from the northern Levant; the relatively few parallels from sites in the Sharon were probably imported (see Gophna and Beck 1981: 61, 64-65). A differently tapered variety, belonging to MB IIB (JH787), possibly also comes from the northern coast of Syria.

The few parallels to geometric marks, seal/scarab impressions, and painted designs (see Chapter 4) further substantiate the typological evidence that sites in Southern Palestine and farther north, including Byblos and the inland Biqa`a Valley, are most involved in foreign relations with Tell el-Dab`a.

Typological *Comparanda*

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
MB IIA	
JH021	Dhahrat el Humraiya (Ory 1948: fig. 34)--grooved shoulder, slightly flattened base
JH022	Tel Mevorakh (Stern 1984: fig. 14.22)
JH067	JH802--MB IIB Ain Zurekiyeh (Gophna and Ayalon 1982: fig. 6.6) Bat Yam and Gat Gal'on (Gophna and Beck 1981: figs. 9.12 and 12.20) Tel Poleg (Kochavi, et al. 1979: fig. 8.18)
JH093	Tel Aphek (Beck 1985: fig. 2.12) Sinai (Oren, unpublished report, no. 18933)
JH131	Tel Aphek (Beck 1975: fig. 15.9; 1985: fig. 4.15)
JH260	Ruweise/Kafer Djarra, tomb 73 (Guiges 1938, fig. 77, bottom left) Tel Aphek (Beck 1985: figs. 4.13, 5.12)
JH262	Incised mark near handle: Byblos, tombs I-III (Tufnell 1969: fig. 6.55)
JH121	Bat Yam and East of Yavne Yam (Gophna and Beck 1981: figs. 9.13 and 10.22)
JH122	JH116--MB IIA Polished Amphora jug Sinai (Oren, unpublished report, no. 19038)--probably Polished jar/jug
JH125	South of Tel Dor (Gophna and Beck 1981: fig. 2.11) Cf. Tel Zeror (Kochavi, et al. 1979: fig.18.3)
JH129	Nahariyah (Ben-Dor 1950: fig. 21d) East of Ramle prison (Gophna and Beck 1981: fig. 6.6) Tel Aphek (Beck 1985: fig. 4.11) Tell Qiri (Ben-Tor and Portugali 1987: fig. 62.12)
JH761	Bat Yam (Gophna and Beck 1981: fig. 9.9)

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
JH782	Tell el-`Ajjul (Petrie 1933: pl. 37.43F4')--rim inturned slightly
JH794	Tel Ifshar (Paley, unpublished report, Baskets 5956/2 and 5944, Locus 1111)
JH843	Bat Yam (Gophna and Beck 1981: fig. 9.7) Gezer (Dever 1986: pt. 2: pl. 2.20) Tel Aphek (Beck 1985: fig. 4.14)
JH853	JH777--MB IIB Ruweise/Kafer Djarra, tomb 62 (Guiges 1938, fig. 63) Tel Zeror (Kochavi, et al. 1979: fig. 17.19)--more splayed and pointed
MB IIA-B	
JH094 (Pl. 1d)	Tell el-Far`ah North (Mallet 1973: pl. 23.1)
JH138	Shechem (Cole 1984: pl. 41e)
JH252	Tell el-`Ajjul (Tufnell 1962: fig. 10.16)
JH257	Tell el-`Ajjul (Tufnell 1962: fig. 13.57)
JH733	Gezer (Dever 1986: pt. 2: pl. 2.19) Jericho (Kenyon 1960: fig. 137.2)--rim more outsplayed Tel Zeror (Kochavi, et al. 1979: fig. 18.21)

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
MB IIB	
JH011=JH904	Tel Aphek (Beck 1975: fig. 7.5)-handleless Cf. Shechem (Cole 1984: pl. 34j) Cf. Tel Poleg (Kochavi, et al. 1979: fig. 8.19)--rim less squared off, no ext. ridge
JH117=JH118	Gibeon (Pritchard 1963: fig. 34.1) (Pl. 2c)
JH775	Gezer (Dever 1986: pt. 2: pl. 6.5) Tell el-`Ajjul (Tufnell 1962: fig. 14.58) Tell Burga (Kochavi, et al. 1979: fig. 11.13)--more pointed Tell Qiri (Ben-Tor and Portugali 1987: fig. 62.10)
JH802	Shechem (Cole 1984: pl. 41c) Tel Aphek (Beck 1975: fig. 5.11 and 7.21)
JH804	Tell Burga (Kochavi, et al. 1979: fig. 11.14)
MB IIB-C	
JH703	Incised mark: Tell el-Ajjul (Petrie 1932: pl. 32.43D[8] and Tufnell 1962: fig. 3.1)--midway between handles
JH898	Byblos, tombs I-III (Tufnell 1969: fig. 6.56)
MB IIC	
JH809	Beth Shemesh (Grant 1929: 153, no. 361)

5. Summary

While the fuller implications of the NAA and typological study of the 290 Canaanite Jars from Tell el-Dab`a are reserved for Chapter 6, the basic findings can be summarized as follows:

1) The vast majority of the Canaanite Jars were imported from Southern Palestine, viz., from the Gaza Group of Middle Bronze Age sites. Chemical comparability is particularly close for examples from Tell el-`Ajjul (which has been identified as ancient Sharuhen) and Ashkelon.

2) Very few Canaanite Jars (less than 1% of the corpus) were imported from elsewhere. If possible imported amphoras are also considered, however, four principal regions of origin may be proposed:

a) coastal Lebanon (Sidon and Tell `Arqa)

b) the inland Biqa`a Valley of Lebanon (Kamid el-Loz)

c) inland Syria (Tell Mardikh/Ebla and the upper-middle Orontes River valley)

d) the Fayyum-Maadi region of Middle Egypt

Mid-coastal Palestine, as represented by Jaffa, Tel Aphek and Tel Ifshar, contributed minimally to the imported pottery from Tell el-Dab`a. In fact, the NAA results show that this region was more often a recipient of imports, which were generally Canaanite Jars, carinated bowls and juglets from Southern Palestine, than a source (see JH553, JH560, JH563, JH570, JH586, JH621, JH626, JH627, JH629, JH647, JH649, JH650, JH652, and JH653 in the Appendix 2, although the data for these samples are not published in this volume).

3) The pattern of importation of Canaanite Jars to Tell el-Dab`a--in terms of absolute numbers, relative percentages, and origins--is very constant from MB sub-period to sub-period. A follow-up NAA study, which targeted MB IIA pottery and fabric types believed to be of northern Levantine origin, confirmed that Southern Palestine was the major source of imported amphoras, with a minor component from elsewhere.

4) Local production of Canaanite Jars, using Nile alluvial clay, is already attested in MB IIA, and continues to increase in importance until the locally made component in MB IIC constitutes about a quarter of the vessels.

5) Stylistic parallels to the Tell el-Dab`a Canaanite Jars provide a less focused perspective on origins, because of the similarity of amphora types throughout Syria-Palestine during the MBA. In general, the best *comparanda* are attested from sites along the Eastern Mediterranean coast from the Sinai north to Byblos, which is in accord with two focal regions (Southern Palestine and coastal Lebanon and Syria) attested by the NAA study. Inland Lebanon and Syria, two other regions of possible pottery export according to the NAA results, are difficult to control typologically, since relatively few MB sites have been well-excavated and published. Unless the few fragments that possibly come from inland Syria are from other vessel types, it is difficult to explain the apparent absence of handled storage jars in this region. It is impossible to distinguish Canaanite Jars made of Nile alluvial clay or Fayyum-Maadi clay from Levantine examples solely on the basis of stylistic criteria.

6) The Vienna System of macroscopic fabric assignment is largely supported by the NAA study. Egyptian marl fabrics are sometimes confused with Levantine fabrics, probably because of similar geological origins. Specific fabrics at Tell el-Dab`a have been clarified by the NAA results: marl II-c derives from the Upper Eocene clay deposit in the Fayyum-Maadi region, and marls II-a and II-f are possibly of Upper Egyptian origin (also see Chapter 6). The Nile alluvial fabrics cannot be distinguished chemically, but all probably originate from deposits in the vicinity of Tell el-Dab`a.

7) Canaanite Jars were valuable both as containers for importing commodities from Southern Palestine and elsewhere, and for secondary uses. They occur throughout the Dab`a excavations in residential and burial contexts, where they served as storage containers, coffins for neonates and infants, and for burial offerings.

Chapter III

THE POLISHED VESSELS

Polished vessels of various types--bowls, jars, jugs, and juglets--constitute 26% of the Tell el-Dab`a NAA corpus (155 specimens). The second half of the Middle Bronze Age (MBA) is poorly represented compared to the first half (Tables 4 and 6).

1. Stylistic and Technological Overview

Careful hand-burnishing over most of the exterior surface (except the underside of the base) characterizes this exclusively wheel-thrown, high-fired class of vessels. It should be noted that only one truly open form (in which the mouth has a wider diameter than any other part of the vessel) occurs in the Polished group, viz., JH106 (Pl. 9c, MB IIA-B), and it is polished on the interior and exterior. Exterior surface colors range from red to yellow to brown to black; some examples are mottled red, brown, and/or black, e.g., JH115 (Pl. 10c, MB IIA), JH286 (not illustrated, MB IIA), JH283 (MB IIA-B), and JH383 (MB IIB), due to irregular firing. Reds predominate, reaching a maximum frequency in MB IIB-C, while browns and blacks are less common and yellows rare. Polishing is *de rigeur* for two other classes of MB pottery--Painted (Chapter 4) and Tell el-Yahudiyeh types--that also share many other typological and technological features with the Polished group.

Of the 138 vessels that are illustrated in Figures 72-100 and 117, piriform jugs, juglets, and miniature juglets were analyzed to a far greater extent than any of the other Polished types (Table 6), reflecting their relatively larger numbers in all of the MB sub-periods at Tell el-Dab`a. Rim and base profiles, handles, and even minor decorative elements are so rigidly standardized that the types and sub-types provide minimal chronological specificity.

Miniature juglets, defined here as less than 10 cm in height, are confined to MB IIA-B and MB IIB, and are especially prevalent in the latter sub-period. Medium-sized specimens, ranging in height from 10 to 20 cm, are frequent in all sub-periods of the MBA. The several examples that exceed a height of 20 cm--viz., MB IIA JH102 and JH306 (Pl. 8a), and MB IIA-B JH316 (Pl. 5c), JH363 (Pl. 6d), and JH876--are best designated jugs. The latter vessels have classical piriform shapes and sometimes decorative elements (incised lines at the base of the neck). JH102 is unusual in having a wide, trefoil mouth, which might be classified either as Jp.11 (as in Table 6) or Jg B, according to the typology presented in Cole (1984: table 5, pls. 30 and 40). Shapes that are more elongated/ovoid (e.g., JH377 [MB IIA-B], JH275 [MB IIB], JH333 [MB IIB-C]), globular (e.g., JH374, Pl. 7c, MB IIB), and bulbous (e.g., JH903, MB IIB) increase in frequency from MB IIA-B onwards (compare, however, the bulbous shape of JH099, dating to MB IIA). Carinated or more angular jugs and juglets (MB IIA JH372 and JH834, and MB IIA-B JH105 and JH352) are comparable to the side profile of bowl type Bc A (Cole 1984: pl. 16; see below). One large vessel without handles (JH304, MB IIB), a "jar," is assigned to the carinated jug/juglet class because of its shape.

Incised horizontal lines at the base of the neck, which are a primary decorative feature of Polished jugs and juglets, are also attested in the NAA corpus, but only in MB IIA-B and MB IIB. The following examples are illustrative: JH105, JH316 (Pl. 5c), and JH352, dating to MB IIA-B, and MB IIB JH270 (Pl. 6e).

The rim profiles of the Polished piriform jugs, juglets, and miniatures are generally plain or exteriorally developed rounded, everted rims (sub-types Jp.11 and Jp.21, respectively, in Cole 1984), which are well-attested throughout the MBA (Table 6). Sub-type Jp.21 is sometimes referred to as the "stepped rim" or, if it is more flaring, the "candlestick" rim (Epstein 1974; Beck 1975 and 1985; Ilan 1991). Sometimes, the plain rounded rim is inverted (e.g., JH104 [MB IIA-B], JH371 [Pl. 6c, MB IIA-B], and JH721 [MB IIB]) or, rarely, has an upright stance (e.g., JH717, MB IIB). Plain rims are also flattened (sub-type Jp.12): JH377 (MB IIA-B) and JH725 (MB IIB); or tapered (sub-type Jp.13): JH354 (Pl. 5d, MB IIA-B), JH365 (Pl. 6b, miniature, MB IIA-B), and JH722 (MB IIB). In MB IIA only, exteriorally developed rims are flattened (sub-type Jp.22, JH326) or tapered (sub-type Jp.23, JH833). Interiorally and exteriorally profiled rims (sub-types Jp.41-Jp.43), forming a "gutter" or concavity around the interior of the vessel's mouth, occur to a limited extent: JH689 (MB IIA), JH348 (MB IIA-B), JH876 (MB IIA-B), and JH866 (MB IIB). One example of an interiorally and exteriorally developed rim (sub-type Jp.44, JH358, MB IIA-B) is smoothly contoured; the base of the vessel is also the only instance of a concave flat button base (sub-type 0.61) in the corpus.

Everted rims, especially those that are profiled on the exterior ("stepped"), together with narrow, sometimes pinched mouths, are ideal for stoppering and pouring a liquid. A cut-away spout, occurring only in MB IIA-B (JH104, JH363 and JH371 Pl. 6c-d) is more elegant, but less practical.

Bases, which were made by trimming the vessel after drying, in the upside-down mode, belong to four main classes:

TABLE 6
TYPOLOGY OF MIDDLE BRONZE POLISHED VESSELS
AT TELL EL-DAB'A*

Description	Type	MB IIA	MB IIA-B	MB IIB	MB IIB-C	MB IIC	?
Carinated Bowl rounded rim	Bc A-B.11	1	1	3	0	0	0
Globular Bowl rounded rim	Bg B.11	1	0	0	0	0	0
Deep Globular Bowl rounded rim	Bd C.11	1	1	0	0	0	0
Deep Globular Bowl flattened rim	Bd C.12	0	1	0	0	0	0
Low-Necked Bowl int. rim projection	Bn A.31	1	0	0	0	0	0
Low-Necked Bowl rounded rim	Bn A.21	1	1	0	0	0	0
Platter Bowl int. squared, ext. flattened rim	Bp.32	0	1	0	0	0	0
Bowl questionable type, plain rounded rim	B Misc.11	0	0	1	0	0	0
Bowl questionable type,	B Misc.?	0	0	0	0	1	0
Bowl base convex	B Misc.0.13	0	1	0	0	0	0
Bowl base flat disk	B Misc.0.21	3	2	1	0	0	0
Bowl base tapered pedestal	B Misc.0.43	0	1	0	0	0	0
Bowl base three-looped	B Misc.0.5	0	1	0	0	0	0
Bowl base questionable	B Misc.0.?	0	0	0	0	0	0
Dipper Juglet	Jd.11	0	3	4	1	0	0
Shoulder-handled jug rounded rim	Jg A.11	2	0	0	0	0	0
Shoulder-handled jug	Jg A.11.0	1	0	0	0	0	0
Piriform juglet rounded rim	Jp.11	5	8	8	2	0	0
Piriform juglet miniature, rounded rim	Jp.11	0	0	1	0	0	0
Piriform juglet flattened rim	Jp.12	0	3	3	1	0	0
Piriform juglet miniature, flattened rim	Jp.12	0	0	0	1	0	0
Piriform juglet miniature, tapered rim	Jp.13	0	1	1	0	0	0
Piriform juglet ext. rounded rim	Jp.21	0	8	6	1	0	0
Piriform juglet ext. flattened rim	Jp.22	1	0	0	0	0	1
Piriform juglet ext. tapered rim	Jp.23	1	0	0	0	0	0
Piriform juglet int., ext. rounded rim	Jp.41	1	4	0	0	0	0
Piriform juglet int., ext. flattened rim	Jp.42	1	0	1	0	0	0
Piriform juglet int., ext. tapered rim	Jp.43	0	1	0	0	0	0
Piriform juglet elaborated	Jp.44	0	1	0	0	0	0
Piriform juglet questionable type	Jp.?	3	3	0	0	0	0
Jar or Jug(let) ext. flattened rim	JJ.22	1	0	0	0	0	0
Jar or Jug(let) miniature, questionable	-	0	0	8	0	0	0
Jar or Jug(let) base plain flat	JJ.0.11	2	3	0	0	0	0
Jar or Jug(let) base plain convex	JJ.0.13	0	5	5	1	0	0
Jar or Jug(let) base flat disk	JJ.0.21	1	3	1	0	0	0
Jar or Jug(let) base convex disk	JJ.0.23	1	1	0	0	0	0
Jar or Jug(let) base rounded ring	JJ.0.31	3	2	4	2	0	0
Jar or Jug(let) base flattened ring	JJ.0.32	0	1	0	0	0	0
Jar or Jug(let) base ring with button	JJ.0.35	0	1	0	0	0	0
Jar or Jug(let) base rounded button	JJ.0.61	0	4	10	0	0	2
Jar or Jug(let) base flattened button	JJ.0.62	1	5	3	1	0	0
Jar or Jug(let) base questionable	JJ.0.?	0	0	6	1	1	0

*Two polished vessels in the follow-up NAA study (PMG103 and PMG105) are omitted from the tabulation.

1) A plain base, which is flat or convex (pointed only in MB IIB): sub-types 0.11 and 0.13.

2) A flattened or convex disk base: sub-types 0.21 and 0.23.

3) A ring base, which is rounded, flattened, elaborated, or with a central button: sub-types 0.31, 0.32, 0.34, and 0.35, respectively.

4) A rounded or flattened button base: sub-types 0.61 and 0.62.

The base types are not correlated with any particular vessel size, shape, rim profile, or other stylistic attribute. Because the bases of many examples are unclassified and because of continuous gradations between sub-types (for example, disk bases and the longer, narrower button bases), no chronological inferences can be drawn. Button bases can be rather stubby (JH310, MB IIA-B), JH877 (MB IIA-B; JH098, MB IIB; and JH270, Pl. 6e, miniature, MB IIB), straight-sided (JH889, MB IIA; JH354, Pl. 5d, MB IIA-B; and JH362 (MB IIB), or, especially in later MB sub-periods, curved outwards (JH337 and JH347, Pl. 7a, MB IIB) or flaring (e.g., JH298 and JH301, MB IIB). A single ring base with button (JH105, MB IIA-B) is represented in the corpus. Except for some of the better-made ring bases, these vessels would not have been able to stand on their own; they might have been hung by strings through their handles or variously propped up.

Handles, whether single-, double-, or triple-stranded, are similarly non-diagnostic. They can either swing in a high arc (rarely above the rim) and join the side of the neck or be attached to the top of the rim. Two examples--JH329 (Pl. 5f, MB IIA-B) and JH274 (Pl. 6h, miniature, MB IIB)--have shoulder handles (see below). Handle attachment to a neck ridge, which is associated with a "stepped" rim (above), appears to be confined to MB IIA (JH306). The three-stranded handles show some interesting variations, either having the strands placed side-by-side (JH357, miniature, MB IIB) or one strand mounted above a pair in snake-like fashion (JH833, MB IIA; JH316, Pl. 5c, MB IIA-B; and JH289, MB IIB). Other examples dating to MB IIA (JH372) and MB IIB (JH717) have clay knobs at the base of the handles. Individual strands, which were made from coils of clay, are generally circular in cross-section.

Dipper juglets are more elongated (but rarely exceed 20 cm in length--e.g., JH107, MB IIB) and have more rounded shoulders than their piriform counterparts (compare JH858, Pl. 8b, dating to MB IIA). In general, these vessels have pointed bases (slightly flattened on JH103, Pl. 8c, MB IIA-B), plain rounded rims (inturned on JH297, MB IIB) that are pinched, and single-stranded handles (circular in cross-section) attached to the top or just below the top of the rim.

Large elongated/ovoid jugs with a single- or double-stranded handle mounted on the shoulder (type Jg A), which are referred to as "amphora jugs," occur only in MB IIA (JH115 and JH116, Pl. 10c, and JH880). They all have ridges at the base of the neck. The everted plain rounded rim of JH116, which swirls back on itself towards the sidewall is similar to an important, imported Canaanite Jar rim variety (Chapter 2). The double-standed handle on JH116 is also unusual in being bifurcated at its lower end. The only preserved base on an amphora jug is of the convex disk sub-type (again JH116).

A unique MB IIA vessel (JH840) is similar in its overall dimensions to that of a standard Canaanite Jar (Chapter 2), but it has a plain flat base and lacks handles. Because it is somewhat shorter than the average Canaanite Jar, the volume of the vessel was probably about 20 l. The small pithos shape has an everted rim, which is developed exteriorally and flattened, and a prominent neck ridge.

The remaining Polished vessels fall into several bowl classes according to the typology in Cole 1984. Most of these generally large specimens, however, might better be denoted jars or kraters, since they are **closed** vessels, the diameter of the mouth being less than the maximum diameter of the vessel. This characteristic is most apparent for the so-called deep globular "bowls" with their incurved walls (sub-type Bd C) and, to a lesser extent, for the low-necked "bowls" (sub-type Bn A). Both sub-types are restricted to MB IIA (JH726 and JH728) and IIA-B (JH727, JH885 and JH886, Pl. 10a-b), and share many stylistic attributes--long globular bodies, moderately narrow mouths, everted plain rounded rims (developed exteriorally on JH728, and flattened on JH885, Pl. 10a), and plain convex and flat disk bases where preserved.

A globular bowl with a wide mouth (sub-type Bg B--JH879), everted plain rounded rim, and flat disk base was recovered from an MB IIA context. A more S-shaped or slightly carinated form (sub-type Bc B) is represented by examples dating to MB IIA (JH324) and IIB (JH343, Pl. 9b, and JH830, Pl. 9d), again with everted plain rounded rims and flat disk bases. Relieving this evident stylization is the incised design of interconnected spirals and a wavy line below the rim of JH830 (Pl. 9d, MB IIB).

One truly carinated bowl (sub-type Bc A) is included in the NAA corpus (JH856), dating to MB IIA-B. It also has an everted plain rounded rim, but its flat disk base is splayed out and there is a ridge at the base of the neck. Three Miscellaneous bowls (JH361 [MB IIB], JH896 [MB IIB], and JH373 [MB IIC]) have incised geometric, probable floral, and spiral designs. Incised designs on Polished bowls in the NAA corpus do not precede MB IIB.

What is called a platter bowl (sub-type Bp) is the only truly **open** form in the Polished group. It is represented by one example (JH106, Pl. 9c, MB IIA-B) that has a

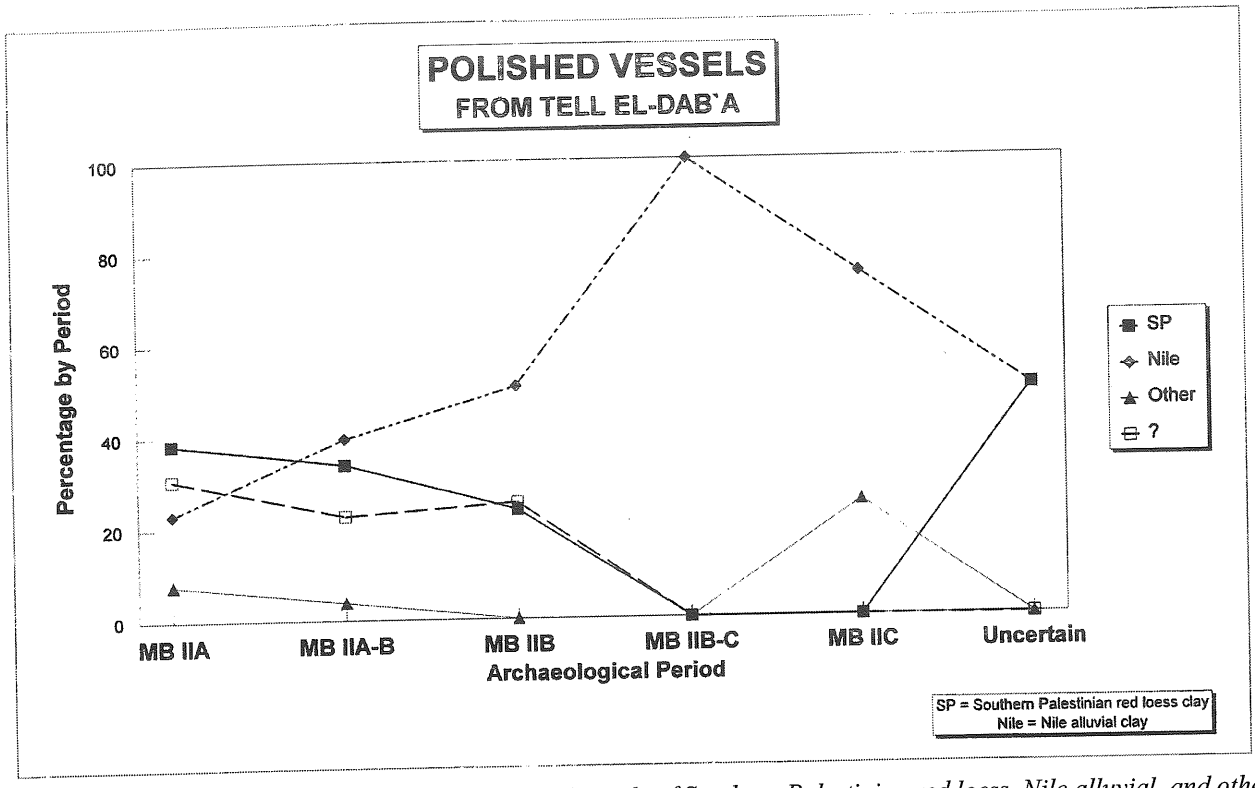

Fig. 23: Relative percentage of Polished pottery vessels made of Southern Palestinian red loess, Nile alluvial, and other clays at Tell el-Dab`a, for each sub-period of the Middle Bronze Age. Samples with uncertain proveniences (?) are also shown.

squared inverted rim, with a flattened exterior edge, and a three-looped base.

2. Neutron Activation Analysis Results

In general, the Polished vessels follow a very similar chronological development in the relative numbers of imported and locally made types for each sub-period of the MBA as that of the Tell el-Yahudiyeh and Painted groups (Chapter 4). As seen in Figure 23, imports from Southern Palestine predominate in MB IIA, with about a quarter of the additional specimens being of Nile alluvial clay (fitting the chemical profile of a probable local Tell el-Dab`a clay bed) and another 30% being of uncertain provenience. In succeeding MB sub-periods, the relative percentage of Southern Palestinian imports drops off to 34% (MB IIA-B), 24% (MB IIB), and is nil by MB IIB-C and IIC, while concurrently the relative percentage of locally produced Nile alluvial clay vessels increases to 42% (MB IIA-B), 51% (MB IIB), 100% (MB IIB-C), and 75% (MB IIC) of the samples tested for each sub-period. Examples with uncertain proveniences continue to constitute about a quarter of the MB IIA-B and IIB groups, dropping off to 0% thereafter.

Two MB IIA Polished vessels are from the site of Tell Ibn Hani, the port town associated with Ras Shamra (ancient Ugarit) in Syria: a piriform juglet (JH286, not illustrated) and a more carinated jug (JH834), which were recovered from MB IIA residential contexts in stratum G of area AII and stratum d2 of area FI, respectively. A miniature juglet (JH288), from an MB IIA-B burial, is of uncertain provenience; it is chemically closest, however, to one of the examples from Tell Ibn Hani, JH286. A dipper juglet with a slightly flattened base (Pl. 8c, MB IIA-B) comes from Megiddo in the Jezreel Valley. Two standard piriform juglets, lacking rims--JH283 (MB IIA-B) and JH378 (MB IIC)--are made of marl clay from the Fayyum-Maadi region, and demonstrate intra-Egyptian contacts.

Whether imported from Southern Palestine or produced locally of Nile Delta alluvial clay, the piriform and dipper juglets are stylistically indistinguishable on the basis of shape, size, decorative elements, or handle, rim, or base type. Examples with cut-away spouts, handle attachment to a mid-neck ridge (JH306), incised horizontal lines at the base of the neck, and the so-called "snake" handle (sometimes with applied knobs at the base of the handle), however, are exclusively imported from Southern Palestine (see above, for stylistic details). The miniature Polished juglets, dating to MB IIA-B and IIB, are from Southern Palestine, with the exception of two Nile alluvial clay vessels (JH365, Pl. 6b, MB IIA-B, and JH320, Pl. 6i, MB IIB) and three examples of questionable provenience. In MB IIB, splayed-out button bases are only made of Egyptian Nile alluvial clay of probable local origin.

Turning to the NAA results for the "amphora jugs" and Polished bowls, including handleless jars and kraters, the following observations can be made:

1) While one amphora jug (JH115, Pl. 10c) comes from Southern Palestine, two other MB IIA examples are of

questionable provenience (JH116 and JH880). JH116 is closest in mean Euclidean space to an Early Dynastic "Abydos jar" (unpublished data), which may be a peripheral member of the Southern Palestinian group (cf. JH836, MB IIA).

2) Deep and low-necked bowls (jars) are made exclusively of Egyptian Nile alluvial clay of probable local origin, apart from one example of uncertain provenience.

3) A handleless piriform jar (JH304, MB IIB) is from Southern Palestine.

4) A unique handleless jar (JH840, MB IIA), which is comparable in size to an Canaanite Jar but shaped like a small pithos, is of uncertain provenience; it is chemically closest to a Late Helladic sample from Sparta in the Peloponnesus of Greece that is itself of questionable origin.

5) Platter, globular, S-shaped, carinated, and miscellaneous bowls, several of which are decorated with incised geometric designs, are all made of Egyptian Nile alluvial clay, probably local to Tell el-Dab`a, with the exception of JH896 (MB IIB), from Southern Palestine, which has an elaborate, incised design of probable floral motifs.

For the Polished group as a whole, fabric sub-type IV-2b-c, denoting a reddish-yellow coloration with small to moderate amounts (1-10%) of fine to medium-sized calcite inclusions (ca. 0.5-2 mm in diameter), is most common in MB IIA (as it is for Canaanite Jars in all MB sub-periods--see Chapter 2, including a more extensive treatment of fabrics) and decreases thereafter. More reddish (sub-type IV-1) or more yellowish (sub-type IV-3) fabrics, as well as fabrics lacking inclusions (sub-type IV-2-3a), are infrequent. Single examples of sub-type IV-5c (a more whitish fabric with a moderate amount of medium-sized calcite inclusions) and sub-type IV.6a (a more whitish fabric with no calcite inclusions) were recorded in MB IIA (JH880 and JH833).

The macroscopic fabric assignments are generally in accord with the NAA finding that type IV fabrics--whether for Canaanite Jar, Polished, Painted, or Tell el-Yahudiyeh pottery types--are composed of Southern Palestinian red loess clay. Some of the Polished examples were initially assigned to or queried as belonging to type IV (viz., JH324 and JH827, MB IIA; JH334, JH856, and JH878, Pl. 6a, MB IIA-B; JH101, JH290, and JH866, MB IIB), but were shown by the NAA analyses to be of Nile alluvial clay, most likely local to Tell el-Dab`a. JH283 (MB IIA-B), although denoted as fabric sub-type IV-2b, proved to be of marl clay (probably sub-type II-c) from the Fayyum-Maadi region. The two examples of IV-5c and IV-6a fabrics are of uncertain provenience.

From MB IIA-B until the end of the MBA, the relative percentage of Polished vessels made of Nile alluvial clay (sub-types I-a, -c, -d, and -e3) gradually increases. Definitions for the fabric classification system, based on macroscopic criteria, can be found in Chapter 2, except for sub-types I-a and I-d (Nile A and Nile D in the Vienna System). These fabrics, which are often difficult to distinguish from one another, are generally reddish-brown in color and contain moderate amounts of fine-coarse quartz and other inclusions; sub-type I-a, however, has more mica, and type I-d was tempered with medium-sized calcite particles (0.3-1 mm in diameter). The NAA data confirmed the Nile alluvial clay origin of all the fabric I sub-types, additionally implying that the vessels were locally made, based on their tight chemical grouping with modern and ancient clays from Tell el-Dab`a and its vicinity. Two Polished juglets were initially denoted as sub-type I-d (JH890, MB IIB, and JH378, MB IIC); another juglet (JH307, MB IIA) was queried as I-d. According to the NAA results, JH307 and JH890 are definitely from Southern Palestine, whereas JH378 is made of Fayyum-Maadi marl clay.

Fabric type VII (i.e., Minoan) was queried for JH840, from MB IIA stratum d1 in area FI. The unique small pithos, as mentioned above, is possibly of Aegean origin, although stylistic parallels (below) belong to the northern Levantine cultural sphere. Polished examples with questionable NAA proveniences account for about a quarter of the MB IIA, IIA-B, and IIB groups, which is close to the average for the entire Tell el-Dab`a NAA corpus. Besides the examples already mentioned above, JH358 (MB IIA-B) is instructive because of its ambiguous assignment to both Southern Palestine and a sample from the Orontes Valley in inland Syria of uncertain NAA provenience. The most plausible explanation, in the absence of well-defined local groups for inland Syria, is that the Orontes Valley "match" was itself an import from Southern Palestine, and represents trade in the reverse direction from that indicated by Canaanite Jars at Tell el-Dab`a which originated possibly from Ebla and Tell `As (see Chapter 2).

This chapter began with a brief discussion of polishing, a characteristic shared by all vessels of this class, and the variation in the polished surface color--red, brown, black, or the rare yellow. In searching the stylistic and chemical data for any patterns or correlations, it be may noted that brown and black Polished vessels are most likely to come from Southern Palestine in MB IIA and IIA-B, whereas Red Polished vessels of Egyptian Nile alluvial clay are especially popular at Tell el-Dab`a in MB IIB and IIB-C. Except for these very broad generalizations, however, the surface color of a Polished vessel does not appear to be related to any specific shape, rim or base profile, handle, or decorative feature.

3. **Archaeological Contexts and Uses**

In contrast to the Canaanite Jars (Chapter 2; also see Chapter 1 and Table 1), the overwhelming majority of the Polished vessels were recovered from burial contexts. The only exception to this statement is the class of Polished bowls (or kraters) with incised designs, four out of five of which came from residential contexts in areas FI and AII (only JH373, dating to MB IIC, was from a tomb).

Polished vessels that originate from the same geographic region often occur together in MB tombs at Tell el-Dab`a. For example, eight piriform juglets (JH296, JH298-JH303 and JH320, Pl. 6i), including miniatures, and a dipper juglet (JH297) were found in an MB IIB tomb of area AII, and all were determined to be of Egyptian Nile alluvial clay by NAA. A Canaanite Jar (JH069) from Southern Palestine was recovered from the same tomb. Of seven piriform juglets with a range of rim profiles (JH717 and JH720-JH725) from another MB IIB tomb in area FI, four were again made of Egyptian Nile alluvial clay, the other three being of questionable provenience. Two Egyptian-style cups of Nile alluvial clay came from the same tomb (Chapter 5).

Jugs and juglets from Southern Palestine, however, predominate in an MB IIA-B tomb in area AII, including ovoid, bulbous, and piriform shapes and cut-away spouts (JH329, JH355, JH358, JH363, JH364 and JH371, Pls. 5e-f and 6c-d). A Canaanite Jar (JH252) from this tomb was also an import from Southern Palestine. A cluster of Southern Palestinian imports is attested in another MB IIB tomb in area AII which yielded six miniature juglets (JH270-JH275, Pl. 6e-h) and a dipper juglet (JH276). In only one instance was a definite imported juglet (JH379) from Southern Palestine found in association with two juglets (JH321 and JH379) made of local Nile alluvial clay. The sharp dichotomy between local and imported groups of Polished vessels in tombs, which is documented throughout the MBA, may point to specialized economic activities or possibly the ethnic affiliations of some of the Tell el-Dab`a inhabitants, whether directed more to the Delta or the Eastern Mediterranean (for a more detail discussion, see Chapter 6).

Residential contexts with Polished vessels are relatively infrequent in the corpus. One or, rarely, two Polished vessels are represented in each context. Besides the incised bowls, several unusual types are attested in the MB IIA palace in area FI or its vicinity, viz., the unique small pithos (JH840), a jug (JH834) from Tell Ibn Hani in northern Syria, and two amphora jugs (JH116 and JH880) of uncertain provenience. A Red Polished globular bowl (JH879) of Nile alluvial clay was recovered from the same refuse pit in the MB IIA palace that also included Canaanite Jar imports from Tell `Arqa along the northern Lebanese coast (JH120) and possibly from the Kamid el-Loz in inland southern Lebanon (JH122) and Tell Mardikh/Ebla in inland Syria (JH121) (see Chapter 2), along with two flat-bottomed cooking pots (JH126 and JH127; Chapter 5). In area AII, a Polished jug (JH372) from Southern Palestine, with a tripartite and knobbed handle ("snake" variety), was found in an MB IIA storeroom with four Canaanite Jars originating from the same region and one that was of questionable provenience. Although Polished vessels of Nile alluvial clay are the best represented group in the MB IIA-B sub-period (Table 4), none of these examples were from residences. From MB IIB onwards, in keeping with the increasing popularity of locally made pottery and the decline in imports, Polished vessels of Nile alluvial clay have an equal or greater probability of occurring in domestic contexts than do imports.

Until chemical analyses are carried out or other evidence becomes available, the functions of the Polished vessel types in the tombs will remain uncertain. They evidently had some special significance in burial rites, perhaps as food containers or ointment/perfume receptacles. Because local imitations of the imported vessels are restricted to tombs in MB IIA-B, possibly they were at first purely symbolic, empty vessels.

4. Stylistic Interrelationships and Implications

Numerous close typological parallels from well-stratified and well-dated contexts can be cited for the Tell el-Dab`a Polished vessels (see listing below). In general, as for the other classes of Syro-Palestinian vessels in the NAA corpus, the best *comparanda* are with sites in Southern Palestine (e.g., Tell el-`Ajjul), and farther north through the plain of Sharon (e.g., Tel Aphek) and along the Lebanese coast (e.g., Ruweise and Sin el-Fil). However, jug and juglet forms, as well as many of their numerous rim and base varieties, are matched at inland sites in the northern Hill Country of Palestine (e.g., Shechem), Jordan Rift Valley (e.g., Jericho and Tel Dan), Galilee (e.g., Kabri), and even as far north as the Damascus basin (Tell es-Salihiyeh).

The stylistic evidence is sometimes at odds with the provenience as determined by NAA and sometimes supports it. For example, a truncated dipper juglet type is very prevalent at Megiddo in the first half of the MBA, and one example (JH103, Pl. 8c) at Tell el-Dab`a was imported from this site, according to the NAA data. On the other hand, jugs and juglets with cut-away spouts are best paralleled at sites in the northern Levant (e.g., Kabri) and Anatolia. Yet, the examples at Dab`a are exclusively imported from Southern Palestine. This seemingly glaring anomaly can only be explained by the lack of excavated and published MB IIA remains in the latter region (see Chapter 6, for further discussion). It is also doubtful that the prominence of simple everted and rounded rims at inland sites in MB IIB and later helps in understanding the stylistic affiliations of the Tell el-Dab`a Polished pottery, since MB pottery technology was well entrenched throughout inland Palestine by this time.

The amphora jugs and the various bowl types are also broadly represented throughout coastal and inland Palestine, especially during the first half of the period. One MB IIA amphora jug (JH116) has a unique tapered rim type that is turned back on itself, like that on an MB IIA Canaanite Jar (JH122) which was possibly imported from Kamid el-Loz in southern inland Lebanon.

A unique small pithos (JH840), which is possibly of Aegean origin, is similar to examples from northern coastal and inland sites (Tell `Arqa and Dnebi).

Typological *Comparanda*

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
MB IIA	
JH102 (Pl. 8)	Cf. Tell es-Salihiyeh (von der Osten 1956: fig. 96/ pl. 43. TS164)--ridge around neck and disk base
JH115 (Pl. 1c)	Dhahrat el-Humraiya (Ory 1948: fig. 35)--rim outturned, flattened base Cf. Ginosar (Epstein 1974: fig.17.4)--rounded base Cf. Beth Shemesh (Grant 1929: 153, no. 806)
JH116	Cf. JH122, MB IIA Canaanite Jar rim Sinai (Oren, unpublished report,no.19038)--probably Polished jar/jug
JH306	Kabri (Kempinski and Niemayer 1990: fig. 19.8) Megiddo (Loud 1948: pls. 10.21, 7.18) Nahariyah (Ben-Dor 1950: fig. 24c/pl. 9.19) Sin el-Fil (Chéhab 1939: fig. 4b)
JH324	Tell el-`Ajjul (Tufnell 1962: fig. 11.31) Tell Beit Mirsim (Albright 1932: pl. 41.3)--not slipped and burnished
JH372	Kabri (Kempinski and Niemayer 1990: fig. 19.10)--concave disk base, bipartite handle Tel Aphek (Beck 1975: fig. 9.5)--bipartite handle on shoulder Tell el-Far`ah North (Mallet 1973: pl. 15.5)--handle only
JH689	Megiddo (Loud 1948: pl. 19.28)--rim only
JH726	Tel Ifshar (Paley, unpublished report, Locus 1111) Shechem (Cole 1984: pl. 7e)
JH728	Shechem (Cole 1984: pl. 7f)--no ridge Tell el-Far`ah North (Mallet 1973: pl. 28.2)--no neck ridge, flattened base, not slipped and burnished
JH840	Dnebi, tomb 1 (du Mesnil 1930: pl.32)--double-ridged rim, probably not burnished Tell `Arqa (Thalmann 1978: fig. 2, left)--no burnishing, incised lines on shoulder
JH858 (Pl. 8b)	Megiddo (Loud 1948: pl. 12.6)
JH879	Gezer (Dever 1975: fig. 3.11-12)--not slipped and burnished Moza (Sussman 1966: fig. 2.4) --not slipped and burnished Shechem (Cole 1984: pl. 13a) Tell Beit Mirsim (Albright 1933: pl. 4.10)
JH889	Ruweise (Tufnell 1975-76: fig. 2.18) Tel Aphek (Beck 1975: fig. 9.2)
MB IIA-B	
JH103 (Pl. 8c)	Byblos, tombs I-III (Tufnell 1969: figs. 9.6, 10.8) Megiddo (Loud 1948: pl. 12.7, 11) Ruweise (Tufnell 1975-76: fig. 2.23 Tell el-`Ajjul (Tufnell 1969: *passim*)
JH104	Kabri (Kempinski and Niemayer 1990: fig. 19.9)
JH280	Jericho (Kenyon 1965: fig. 98.7)-- not burnished Ruweise (Tufnell 1975-76: fig. 2.19)
JH315	Shechem (Cole 1984: pl. 29d)--only rim, not slipped and burnished Tell el-Far`ah North (Mallet 1973: pl. 27.3)--not slipped and burnished

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
H336	Jericho (Kenyon 1965: fig. 98.3)-- single-stranded handle rising above rim, pointed knob base
JH348	Cf. JH722--MB IIB Polished juglet, rim only Tell el-Far`ah North (Mallet 1973: pl. 25.2)--slight knob base
JH365 (Pl. 6)	Jericho (Kenyon 1965: fig. 98.2—only rim, burnished "self-slip"
JH371 (Pl. 6c)	Cf. JH372--MB IIA Polished jug Kabri (Kempinski and Niemayer 1990: fig. 19.10)--concave disk base
JH379	Tell el-Far`ah North (Mallet 1973: pl. 15.2)--cf. overall form, slight disk base, and shape of single- stranded handle
JH855	Tell el-Far`ah North (Mallet 1973: pl. 26.2)--only rim Jericho (Kenyon 1965: fig. 98.8--not slipped and burnished, more ovoid form, pointed knob base
JH876	Tel Zeror (Kochavi, et al. 1979: fig. 18.23--cf. overall form and base Gezer (Dever 1975: fig. 3.7)
JH877	Jericho (Kenyon 1960: fig. 122.10—black slipped and burnished, knob on top of bottom handle attachment), and 131.6--black slipped and burnished, higher carination, shorter knob base, single-stranded handle); 1965: fig. 98.3--single-stranded handle attached at rim, short knob base
JH885 (Pl. 10a)	Hadar Yoseph (Gophna and Beck 1981: fig. 3.4)
JH886 (Pl. 10a)	Sinai (Oren, unpublished report, no. 19036)--less everted, more ext. developed rim, no base
JH892	Megiddo (Loud 1948: pl. 19.28)--short neck
MB IIB	
JH107	Ginosar (Epstein 1974: fig. 8.2) Shechem (Cole 1984: pl. 27c, g) Tell el-`Ajjul (Tufnell 1962: fig.12.43)
JH271 (Pl. 6f)	Nahariyah (Ben-Dor 1950: fig. 26.b-c--double-stranded handle (c) and no handle (b); Dothan 1956: fig. 5.3--no rim)
JH272 (Pl. 6g)	Jericho (Kenyon 1960: fig. 136.15)--gray burnished, broad form, no rim profile
JH276	Gezer (Dever 1986: pt. 2: pl. 1.5) Tel Zeror (Kochavi, et al. 1979: fig. 18.24)--not slipped and burnished, upright mouth
JH284	Tell el-Far`ah North (Mallet 1973: pl. 27.3)--cf. overall form and knob-ring base, upright base rim, finely made
JH297	Beth Shemesh (Grant 1929: 125, no. 783) Dhahrat el-Humraiya (Ory 1948: fig. 40) Barqai (Gophna and Sussman 1969: fig. 7.2) Ruweise/Kafer Djarra, tomb 74 (Guiges 1938, fig. 89) Tell el-`Ajjul (Tufnell 1962: fig.12.45)
JH320 (Pl. 6i)	Jericho (Kenyon 1960: fig. 122.3—black slipped and burnished, low carination, incised lines at mid- body; 1965: fig. 106.14, 22—piriform-shaped, concave knob bases)
JH337	Megiddo (Loud 1948: pl. 24.17)

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
	Shechem (Cole 1984: pl. 29g)--only rim, not burnished Sinai (Oren, unpublished report, no. 19039)--jug Jericho (Kenyon 1960: fig. 131.3--broad form, single-stranded handle, broad and less well-formed base, "self-slip"; 1965: fig. 106.11, *passim*--sometimes not slipped and burnished)
JH343 (Pl. 9b)	Jericho (Kenyon 1960: fig. 112.5— wide ring base; 1965: fig. 119.8— not burnished) Ruweise/Kafer Djarra, tomb 62 (Guiges 1938, fig. 58p) Tell el-`Ajjul (Tufnell 1962: fig. 11.21) Tell Beit Mirsim (Albright 1933: pl. 4.11)
JH374 (Pl. 7c)	Shechem (Cole 1984: pl. 28a) Cf. Beth Shemesh (Grant 1929: 125, no. 112h)
JH395	Jericho (Kenyon 1960: fig. 131.16--red slipped; 1965: figs. 98.12--not slipped and burnished, 106.27--not burnished; 126.12; *passim*)
JH720	Cf. JH855--MB IIA-B Polished juglet Tel Aphek (Beck 1975: fig. 11.4)--only rim Megiddo (Loud 1948: pl. 10.20) Tel Dan (Ilan 1991: fig. 14.4--only rim, ovoid overall form, triple- stranded handle Cf. Yabrud (Assaf 1967: fig. 3.8)
JH722	Cf. JH348--MB IIA-B Polished juglet, rim only
JH725	Megiddo (Loud 1948: pl. 19.30)
JH875	Jericho (Kenyon 1960: fig. 161.3--black slipped and burnished, single-stranded handle; 1965: figs. 97.11--small knobbed base, 98.4--not burnished, *passim*)

5. Summary

The basic findings for the class of Polished vessels can be summarized as follows:

1) Typologically, nearly all the Polished vessels--whether jugs, juglets, bowls, jars, or amphora jugs--and their numerous rim, base and handle varieties most closely accord with a coastal Palestinian cultural sphere. Some pottery types (see no. 6 below) and features, such as the cut-away spout on jugs and juglets, are better attested at sites farther north.

2) The NAA results generally reinforce the typological assessments: Southern Palestine is the source of the overwhelming majority of the imported Polished vessels. However, the published stylistic evidence can have gaps in it, both spatially and chronologically, as highlighted by the lack of MB IIA and IIA-B cut-away spouts from Southern Palestine, although all the Tell el-Dab`a examples in the NAA corpus originated from this region. Other features are documented only on vessels imported from Southern Palestine, viz., handle attachment to a mid-neck ridge, incised horizontal lines at the base of the neck, and the tripartie, "snake" handle (sometimes with applied knobs at the base of the handle).

3) Except for the three MB IIA amphora jugs in the corpus, all of the Polished pottery types were eventually duplicated in Egyptian Nile alluvial clay at Tell el-Dab`a during the course of the MBA, while concurrently the number of imports dropped off.

4) Apart from one elaborately incised MB IIB deep bowl or krater from Southern Palestine, all of the Syro-Palestinian-inspired bowl types in the NAA corpus that could be provenienced, including the MB IIA and IIA-B deep and low-necked varieties, were made of Nile alluvial clay. Although the other Polished vessel types were being produced at Tell el-Dab`a early in the MBA, relatively more bowls of Nile alluvial clay would be anticipated, because they are not suitable for transporting goods and generally served more utilitarian functions. Indeed, four of five incised bowls, whose unusual decorations might have implied a more specialized usage, were recovered from residential contexts.

5) The only definite imports from the northern Levant--viz., from Tell Ibn Hani on the Syrian coast--were two MB IIA vessels, a carinated jug and a juglet. A miniature juglet, dating to MB IIA-B, is also possibly from this site. A dipper juglet came from Megiddo in the Jezreel Valley.

6) Two Polished juglets, which were made of marl clay from the Fayyum-Maadi region of Middle Egypt, provide evidence of limited intra-Egyptian contacts.

7) A unique small pithos is typologically closest to examples from northern coastal and inland sites of the Levant. The NAA evidence, while not definitive, is suggestive of an Aegean origin.

8) Macroscopic fabric assignments according to the Vienna System are largely in accord with the NAA results. The two examples of a Middle Egyptian marl clay fabric, according to the NAA results, were confused with a Levantine fabric (type IV) and a queried Nile alluvial clay fabric (type I).

9) Multiple examples of Polished vessels, particularly jugs and juglets, in the same burial context were generally all made either of local Nile alluvial clay or had been imported from Southern Palestine. The individual with whom the vessels had been buried might have been engaged in directed economic activity or possibly had ethnic affiliations with the given region from where the vessels originated.

10) The earliest local imitations of imported Polished vessels at Tell el-Dab`a, which are indistinguishable stylistically and technologically from true imports, may have had primarily a symbolic function in tombs.

Chapter IV

THE PAINTED VESSELS

The fifty-five Painted vessels account for only about 10% of the NAA corpus (Table 4), in accord with their relatively lower frequencies in the Middle Bronze (MB) strata at Tell el-Dab`a. Levantine Painted Ware (LPW) is a hallmark of the MB IIA phase (Tubb 1983; Gerstenblith 1983: 59-73; Ilan 1996: 168-69), and the very characteristic "painted Tell el-Yahudiyeh" (pTeY) Ware makes its appearance in MB IIA-B strata. In MB IIC, partly stimulated by painted imports from Cyprus, other Painted pottery types (e.g., Tell el-`Ajjul-style Bichrome) and painted decoration in general gain in popularity.

1. Stylistic and Technological Overview

The Painted vessels are all juglets, jugs, and jars of various types, except for one MB IIA-B platter bowl and the occasional Canaanite Jar (amphora) with a simple monochrome geometric design on an unburnished surface, dating to MB IIA and IIA-B (for a discussion of the designs and their importation from Southern Palestine and the Sidon region of southern Lebanon, see Chapter 2). Three cups of Kamares ware (PMG108-110), also included in the Painted corpus, date to MB IIA.

In MB IIA, LPW jugs with probable shoulder or rim-to-shoulder handled (cf. JH838) and handleless jugs (i.e., jars--e.g., JH831 and JH837, Pl. 11a, c), predominate; unfortunately, many examples are sherds for which the type cannot be determined. The vessels, which were made on a potter's wheel and high-fired, usually have narrow mouths (cf. the wider mouths of jar JH837, and jug JH901, Pl. 11b-c), piriform or elongated/ovoid bodies, and plain flat bases (attested by only one example--JH838). Geometric designs, which are the rule in the MBA, include simple horizontal bands (sometimes combined with wavy vertical, and/or criss-crossed bands), criss-crossed bands (JH901, Pl. 11b), horizontal bands of interconnected triangles (JH893 and MB029, Pl. 12b), concentric circles (JH831, and JH839, Pl. 11a), and a star-like motif to the right of the handle attachment (MB028, Pl. 12a; cf. the incised X-marks on Canaanite Jars, Chapter 2). These designs were generally applied to an irregularly hand-burnished surface, after drying and before firing. This polish was sometimes worn off or difficult to observe, perhaps because this decorative feature was less important for the Painted than the Polished group (Chapter 3). The shoulder was the preferred area of the vessel to decorate, but painting sometimes extends onto the lower part of the vessel (e.g., JH831) and/or to the neck and rim (e.g., JH901, MB012, and MB029, Pls. 11b and 12b). Painting was well-executed by hand, probably with a brush. The concentric circles of JH831 attest to the skill of the artist; note, however, the slight irregularities in band width and alignment on other examples (e.g., MB027 and MB029, Pls. 11g and 12b). Painted designs could be carried out in monochrome red, monochrome black, and bichrome red and black (sometimes dark brown), probably employing an iron-containing red pigment and a manganese-rich mixture of the same pigment for the blacks and browns.

The rims of the MB IIA jugs and jars are plain rounded (forming a bulbous fold and undercut edge on MB029, Pl. 12b), externally profiled with a rounded edge (JH901, Pl. 11b), high-collared (MB012), and internally and externally profiled with a tapered, undercut edge (MB018, Pl. 11f). Of the four handles, three of which are attested only by the broken attachment areas on the bodies of the jugs/juglets, three are simple single strands with circular cross-sections and one is two-stranded (MB028, Pl. 12a).

LPW, which is characterized by bichrome decoration, had begun to disappear by MB IIA-B. Canaanite Jars of this sub-period (JH043 and JH073, and JH873; see Chapter 2), as well as an earlier MB IIA example (JH137), have very simple monochrome designs and are not included in the LPW class proper. A body sherd fragment (MB020), with part of a monochrome red triangular design, is also a marginal LPW specimen.

One Painted piriform juglet (JH318, Pl. 13a) in the MB IIA-B NAA group is assigned to the pTeY class, because its shape is similar to traditional Tell el-Yahudiyeh juglets. The latter, with white-filled punctate decorations, first appear, together with Polished varieties (Chapter 3), toward the end of MB IIA. The pTeY juglet is thus far the sole example from Tell el-Dab`a of such an early date. Although missing its rim, it has a narrow base of uncertain type (possibly a flat button) that was finished off after drying in the upside-down mode. It is decorated with relatively thin horizontal and wavy monochrome black bands over the whole exterior surface of the vessel.

A brown and red bichrome, shoulder-handled jug (JH865) provides evidence that such LPW types still existed in MB IIB. The vessel, which is piriform in shape, has a high-collared rim and a flat disk base. Its decoration is restricted to the shoulder area. Additional jugs/jars are probably represented among the monochrome red- and black-painted sherds. The geometric designs are primarily of the same general kinds that were first established in MB IIA, viz., simple horizontal, vertical, and wavy bands. A "collarette" design in monochrome black paint on a ridge at the base of the neck (MB017, Pl. 12d), however, is the only such example in the NAA corpus. A rim-to-shoulder, single-stranded handled jug (JH380) is piriform in shape, with a simple rounded everted rim, trefoil mouth, and a monochrome red painted design of horizontal and diagonal bands on the shoulder (note that the handle is also decorated with horizontal bands).

Piriform and globular juglets of the pTeY class achieve their greatest popularity in MB IIB and IIB-C, and are

represented by at least three illustrated examples in the MB IIB NAA group:

1) Two piriform specimens, one (JH346) that has black horizontal bands over the whole body, a narrow undefined base, and a two-stranded handle), and another fragment (JH317, Pl. 13b) that has red horizontal bands over the whole body and the single-stranded handle.

2) A globular example (JH864, Pl. 13c), with a rounded base and a single-stranded handle, has black horizontal bands on the shoulder and variously sized swirling concentric circles on the lower body.

As mentioned above, Painted vessels show a resurgence in numbers and varieties in MB IIB-C, continuing into LB IA. Although the group belonging to the later MBA tested by NAA is not very large (and includes no MB IIC examples), the following types and decorations are represented:

1) Three piriform juglets, two of the pTeY class (JH353 and JH897) of class and one with a stepped rim (JH822), with two-stranded handles (note the snake-like arrangment on JH822), and flattened and tapered ring and rounded button bases. Decorations differ on the three examples, including a modified triglyph-metope design on the shoulder and horizontal bands down the rest of the body in monochrome red (JH822), a simple horizontal and wavy band design on the shoulder in thin monochrome black (JH353), and a vertically arranged design of straight and wavy bands in monochrome red (JH897), not unlike the pendent line style of Cypriot imports of the period (below).

2) One globular juglet (MB026), with a rounded base, an everted plain tapered rim, a single-stranded handle, and a monochrome red design of vertical bands.

3) Two jar/jug body sherds (MB030 and MB032, Pl. 12e), with monochrome red and black horizontal bands. MB030 was classified as a possible Cypriot fabric (type VI in the Tell el-Dab`a fabric classification system);

4) A platter bowl (JH328), with a plain flat base and inverted and undercut rounded rim, is decorated with a wide red horizontal band on its interior, beginning at the top of the rim. The type is well represented in the Miscellaneous group (Chapter 5).

5) A Bichrome Cross Line globular jug (PMG127).

Of the several specimens of uncertain date, a Tell el-`Ajjul-style Bichrome sherd (JH331, Pl. 12f), showing a long-billed bird's head in a metope, and an incised and painted jar/jug (JH905, possibly belonging to MB IIA) are most interesting. The latter combines a wide red horizontal band, beginning at the top of the simple rounded and everted rim on the exterior, with incised designs, probably concentric triangles or lotus flowers, that continue down the exterior neck of the vessel.

2. Neutron Activation Analysis Results

The relative numbers of imported and locally made Painted vessels follow the same chronological development that has already been observed for the Polished group in Chapter 3. Southern Palestinian imports constitute a high percentage of the MB IIA and IIA-B assemblages, dropping off precipitously in MB IIB until non-existent by MB IIB-C, at the same time that Painted vessels of Nile alluvial clay, most probably local to Tell el-Dab`a, gradually increase in their relative percentage until they dominate the group by MB IIB-C (Fig. 24).

Many of the MB IIA Levantine Painted Ware vessels have uncertain proveniences, in particular those from stratum d2 in area FI (relative percentage of 64%). Only a third to a half of the samples for later MB IIA strata (d1 and c in area FI, G in area AII) are questionable. As discussed in Chapter 2, this apparent anomaly might be due to imports coming from regions not represented in the NAA data bank or simply be a statistical artifact related to the variable compositions of clay beds, potting traditions, and/or the NAA analysis itself. A follow-up NAA study of early MB pottery types, mainly Canaanite Jars, included only two examples (PMG111 and PMG112) from stratum d2, both of which proved to be of Southern Palestinian origin. Indeed, five of the seven uncertain specimens from stratum d2 in the main study, including the two bichrome jars with concentric circles (JH831 and JH839, Pl. 11a) are chemically closest to the Southern Palestinian group as a whole or specific imports from there found at Tell el-Dab`a. Four other examples from stratum d2--JH837 (Pl. 11c), MB011 and MB012, and MB025--were definitely from Southern Palestine. Thus, a good case can be made for most of the Levantine Painted Ware jugs and jars from MB IIA at Tell el-Dab`a, whatever their type or painted design, having been imported from Southern Palestine. Two later MB IIA specimens (MB013 and MB023, Pl. 11d) of Nile alluvial clay, most likely locally made at or near Tell el-Dab`a, have simple monochrome red designs of horizontal bands, which were burnished after painting.

Three cups (PMG108-110) made of Kamares ware (type VII in the Tell el-Dab`a fabric classification system) from Crete were included in the follow-up NAA study. Because the NAA database lacks coverage of Crete, the cups are all reported to be of uncertain provenience in Appendix 1 and the figure captions. The closest samples in mean Euclidean space are from Cyprus and central mainland Greece. Unless the latter samples were themselves imported from Crete, it is likely that chemically similar clays are to be found in Crete and elsewhere in the Aegean and Eastern Mediterranean.

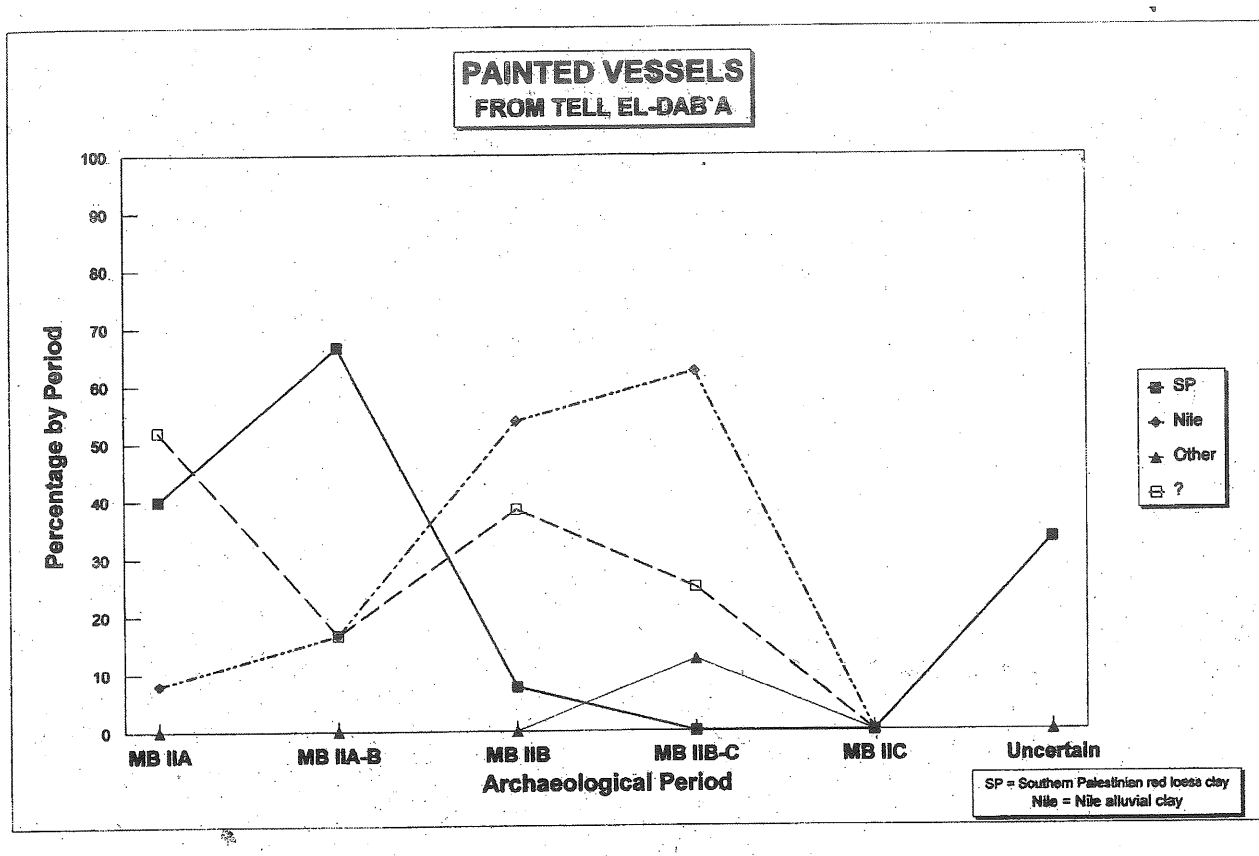

Fig. 24: Relative percentage of Painted pottery vessels made of Southern Palestinian red loess, Nile alluvial, and other clays at Tell el-Dab`a, for each sub-period of the Middle Bronze Age. Samples with uncertain proveniences (?) are also shown.

Southern Palestinian imports, including three amphoras, account for most of the small MB IIA-B group; the earliest painted piriform juglet (JH318, Pl. 13a) is of Nile alluvial clay. Piriform and a globular juglets (JH317, Pl. 13b, and JH864, Pl. 13c) of MB IIB date were also made of Nile alluvial clay, although another MB IIB piriform juglet (JH346) that had a decoration of thin black-painted horizontal bands similar to that of JH318 (above) was of uncertain provenience. Representing a carry-over of the Levantine Painted Ware tradition in shoulder-handled jugs, JH865 was imported to the Nile Delta from Southern Palestine. JH380 an MB IIB jar/jug of uncertain provenience, has stylistic affinities with examples from inland Syria (below). Another jar/jug has a collarette design at the neck-shoulder junction (MB017, Pl. 12d) and is of Nile alluvial clay, as are several other sherds with simple monochrome painted designs.

Except for one small sherd with red and black horizontal bands that derives from Cyprus (MB030), the vast majority of MB IIB-C Painted examples--including two piriform juglets (JH353 and JH897), a globular juglet (MB026), a platter bowl (JH328), and several other painted sherds--are made of Egyptian Nile alluvial clay, probably at Tell el-Dab`a pottery workshops, as were two Bichrome Ware examples (JH331, Pl. 12f, and PMG127). The so-called stepped rim juglet (JH822) is of uncertain provenience, and might have been made in the Galilee or a site farther north where the type predominates (below). The unique incised and painted jug (JH905), which possibly belongs to late MB IIA stratum G in area AII, was imported from Southern Palestine.

As for the other classes of pottery discussed in this monograph, the fabrics of the Painted vessels were mostly assigned to imported fabric type IV-2b-c and Nile alluvial clay sub-types I-d or I-e3 (see Chapter 2, for nomenclature and definitions). Of five examples that were queried to be either types IV-2-3b or VI (Cypriot), viz., JH380, JH826 and JH916 (MB IIB), MB030 (MB IIB-C), and MB019 (uncertain date), four are of uncertain provenience and one was imported from Cyprus (MB030). Two other MB examples--JH899 (Pl. 7e, MB IIB) and JH331 (Pl. 12f, MB IIC?), an `Ajjul Bichrome sherd--were assigned to type VI; they are, respectively, of questionable origin and of Nile alluvial clay. Several samples from the MB IIA, IIB, and IIB-C phases that were classified as type IV and, in one instance, as type II-c marl clay (see Chapter 2) are in fact made of Nile alluvial clay. Only two samples were assigned to or queried as belonging to sub-types I-e3 and I-d, which were actually of Southern Palestinian origin.

3. Archaeological Contexts

by **Tine Bagh**
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Most of the LPW examples from Tell el-Dab'a are fragments from residential contexts and pits. They were recovered predominantly in stratum d2 of Area FI (Bietak 1996: fig. 7) and in the foundational build-up beneath the palace of stratum d1. Stratum d2 was dominated by what has been interpreted as a Syrian "Mittelsaal" house in squares i-j/21-22, which was probably a forerunner of the palace itself, and by a "Breitraumhaus" in squares i/22-23 (Eigner 1985: 21; Bietak 1991a: 32 and 1996: 10, fig. 8). Fragments of one virtually complete jar/jug (JH831, Pl. 11a), decorated with bichrome bands and concentric circles, were recovered from all four squares comprising the "Mittelsaal" house. Fragments of other LPW vessels were also found in the area surrounding the two houses, but are not included in the present study. Pit 53 in nearby square l/20 of Field FI yielded JH838 and JH839, other LPW fragments not included in this study, Canaanite Jar sherds, native Egyptian pottery types, and animal bones (Müller 1995). MB018 (Pl. 11f) was found in another refuse deposit, Pit 40, in adjoining square l/19. LPW is less well attested in the palace itself or in later MB phases. By contrast with the rich assemblage of LPW in area FI, only one example came from the other main excavation area at the site, viz., MB028 (Pl. 12a) from stratum G in area AII, belonging to later MB IIA. It should be noted, however, that the areal exposure of strata G-H in area AII was limited (for additional material now available, see Czerny 1998 and Bagh 1998).

The so-called palace-garden cemetery, which extends south of the residential area in strata d2-d1 of Area FI (Bietak 1990b and 1991a: 31-33), has produced some LPW, but not nearly in the quantity that might have been expected in light of burial contexts elsewhere in the Levant (see the numerous parallels cited in the next section).

Monochrome painted pottery, which predominates in MB IIB and later, is about equally represented in burial and residential contexts. Rarely, a bichrome decorated vessel occurs that carries on the LPW tradition, such as the MB IIB jug (JH865) from a tomb in area FI and another jug (JH380) of the same date, with a unique monochrome motif, that was recovered from an offering pit associated with a tomb in Area AII (Müller 1996: 118, 191). The painted Tell el-Yahudiyeh (pTeY) juglets, which represent a local Egyptian innovation, were standard grave goods, as were the incised and white-filled Tell el-Yahudiyeh and Polished juglets on which their shapes and other features were based.

4. Stylistic Interrelationships and Cultural Importance

by **Tine Bagh**

Although the Painted pottery constitutes a small percentage of the MB pottery found at Tell el-Dab`a and although the various types may not be adequately represented in the NAA corpus, LPW has been cited as the most significant link to MB IIA Levantine sites (Bietak 1991a: 33, 53-54; 1992: 32; and 1996: fig. 29; also see Weinstein 1992: 28-29) where it had already appeared in the earliest MB IIA strata (contra Ward and Dever 1994: 77). This study presents the first published evidence from stratum d2, together with a larger group from later MB phases, clearly demonstrating that LPW had already appeared in the earliest MB IIA phase at Tell el-Dab`a. The importance of LPW for the origins and development of Levantine urban culture has also been dealt with by Tubb (1983), Gerstenblith (1983: 59-73), and Ilan (1996: 168-69).

Amiran (1969: 113-118) tentatively compared the MB IIA Levantine pottery to the Khabur Ware as defined by Mallowan (1936:12; 1937: 102-104), and pointed out the similarities in some of the decoration, including simple horizontal bands and cross-hatched triangles. Gerstenblith (1983: 59-73) grouped the Levantine painted storage jars from MB IIA (her MB I) with the Khabur Ware. At the same time, she pointed out regional differences, such as the fact that, while most painted MB IIA jars were decorated only with horizontal bands, examples from some Levantine sites (e.g., Tarsus) showed greater variety in decoration and were closer in type to the jars from the Khabur region itself. She stressed, however, that the term, Khabur Ware, should be restricted to pottery from northern Mesopotamia and not applied to Levantine variants. Other painted pottery, such as her "collarette juglets" with an interior gutter rim (Gerstenblith 1983: 66-67, fig. 22), were included in a second pottery group, designated as Syro-Cilician Pottery. The motif of concentric circles, which is common on the juglets (see JH831, Pl. 11a, and typolological *comparanda*, below), is also attested for jars. Gerstenblith also noted that the "eye" jug of the Syro-Cilician tradition was paralleled at the Palestinian sites of Tel Aphek and Gezer.

Tubb (1983) was more conservative in his assessment of the stylistic relationships of MB IIA painted pottery, and completely rejected a relationship between the Khabur Ware and Levantine pottery. Instead of assigning different motifs and shapes to sub-groups, he defined two broad traditions: the Amuq/Cilician ware, which is found in southeastern Anatolia and inland Syria as far east as Tell Mardikh and south into the Orontes Valley, and Levantine Painted Ware (LPW), which occurs along the coast of Syria, Lebanon and Palestine as well as in inland regions south of the Orontes Valley. Examples of each tradition occur together only in the Orontes Valley, as, for example, in Tomb 1 at Qatna and in occupational contexts at Hama.

Beck (1985: 197) emphasized that the painted pottery of Palestine and the coast up to Ras Shamra was dominated by bichrome (red and black) designs. She suggested that the Syrian littoral was the origin of this pottery, in contrast to Tubb (1985) who viewed the MB IIA pottery of Palestine as a local development from an EB IV tradition. BECK, however, agreed that a connection to Khabur Ware was unlikely.

Nigro (1997) argues that a clear-cut dichotomy between the two painted traditions, as described by Tubb, does not hold up. Based on his extensive study of the MB pottery at Ebla and its affiliations to that at Hama, he has identified what he calls a Common Painted Ware that has strong ties to the more luxurious North Syrian/Cilician Painted Ware. Although lacking the distinctive animal motifs of the latter, Common Painted Ware with simpler designs (e.g., oblique lines, cross-hatched triangles on the shoulder of the vessel, etc.) are at home in the Amuq-Cilician tradition. The Hama and Qatna vessels, which Tubb assigned to LPW, are better thus understood as local variants of the northern group.

Ilan (1996: 168-69), in dealing with the MB painted pottery from Tel Dan, also contests Tubb's view that LPW is not related to northern traditions. In particular, he identifies a Monochrome Painted Cream Ware (MPCW), which is again a variant of the more general Amuq/Cilician ware tradition. In MB IIA-B and MB IIB, the concentric circle design of LPW is also found on stepped rim juglets (see Chapter 3, for definition), which, in other respects, are most closely related to MPCW (compare JH822).

The MB IIA Painted pottery from Tell el-Dab`a is characterized by bichrome decoration and designs, such as the concentric-circle motif, and fits best with a southern coastal Levantine tradition. The relative paucity of the painted "collarette" (i.e., a monochrome horizontal band with vertical tics at the neck-shoulder junction; contrast Gerstenblith's usage, above), which is well-attested for LPW, is probably fortuitous. Despite a continuing debate about its origins, LPW remains a convenient term for this group of pottery, largely confined to the Levant proper, that have many features in common and are generally bichrome-decorated. This tradition, although gradually decreasing in importance, is still attested in MB IIB (JH865), but has generally been superseded by other classes of Painted pottery (e.g., pTeY juglets and different monochrome jar and jug types) by this time. Canaanite Jars with simple monochrome designs and large "marks" (see Chapter 2) are essentially a minor sub-group of the much larger undecorated corpus of amphoras. In general, Painted vessels that belong to MB IIB or a later phase, such as platter bowls with interior red painted horizontal bands or types influence by Cypriot designs, may have developed out of the LPW tradition but are readily distinguished from the latter.

Typological *Comparanda*

While the figures and plates are arranged chronologically by MB phases, the discussion here is by pottery type. The cited parallels, which are not intended as an exhaustive listing, are particularly important in reconstructing the relative chronology and the possible regional relationships of a given type. In many instances, the parallels enable the reconstruction of the whole shapes of vessels that are represented only by sherds at Tell el-Dab'a. Parallels are listed from south (including Nubia and Egypt) to north, with the sites along Levantine coast preceding those farther inland. Unless otherwise indicated, the *comparanda* are from secure MB IIA contexts.

Both form and painted decoration are taken into account in citing parallels. Fabric and manufacturing technique, which are poorly treated in the literature, are assessed to a limited extent.

Canaanite Jars

1) with monochrome red bands: JH043 and JH873, both MB IIA-B

Tell Beit Mirsim (Albright 1933: pl. 4.13)--criss-crossed bands between two horizontal bands on shoulder.

Gezer (Macalister 146.1)--"Second Semitic" Period, ca. 1800-1400 B.C., miniature, two red bands on shoulder.

Tel Aphek (Beck 1975: Fig. 3.7-10)--very narrow bands, sometimes combined with wavy and criss-crossed bands

Megiddo, =tomb 5104 (Loud 1948: pl. 18.2)--broad band similar to JH043.

Tel Nami (Marcus 1991: 110)

Considering the enormous number of Canaanite Jars that have already been found at Tell el-Dab'a, as well as at many other Levantine sites, it is surprising that relatively few examples have painted decorations. When they are decorated, the designs are often very simple, consisting of only one or two red bands. Possibly, this lack of decoration is related to the utilitarian purposes to which the Canaanite Jar was put. The examples that have been found are generally confined to the MB IIA and MB IIA-B phases.

2) with a large "mark," viz., a bisected circular-like design, which is set somewhat off-center between the handles: JH137 (MB IIA) and JH073 (MB IIA-B).

Tel Aviv harbor (Kaplan 1955: fig. 1.1)--MB IIA-MB IIB (*apud* Ward and Dever 1994: 66-67), pithos with incised wavy band on shoulder, white-painted cross within circle.

Megiddo (Loud 1948: pl.18.7)--star-design

A related example of a trident-like design (bisected semi-circle) occurs at Tell el-Dab`a (registration no. 3358B). Beck (1975: 80-82) has discussed the occurence of the "cross enclosed in a circle" motif, including the Tel Aviv parallel, cited above, and red-cross bowls. A similar mark also occurs on a Canaanite Jar from another eastern Delta site, Saft el Henneh, which was dated by the excavator to Dynasty 26 or later (Petrie 1906: pl. 39G.207) and has recently been dated to Iron I (Aston 1998: 679).

LPW Jars/Jugs: medium-sized

The "handleless jars" (Amiran 1969: pl. 31.2-3, photo 102), which are common at Megiddo and Tel Aphek, and jugs, often with double- or triple-stranded handles attached to the shoulder (Amiran 1969: photo 106), are the primary types under this category. Because of their fragmentary nature, the forms of some examples cannot be determined. Fabrics appear to be relatively hard-fired and with few inclusions.

1) bichrome concentric circles: JH831 (Pl. 11a), MB IIA (note that unillustrated fragments indicate that the smallest innermost circle is black painted).

Tel Aphek, tomb 494 (Beck 1975 : fig. 1.9)

Megiddo, E=tomb 5147, stratum XIIIB *apud* Kempinski 1989: fig. 20.16 (Loud 1948: pl. 13.5)--broader neck, more angled shoulder, zig-zag band on lower neck.

Ruweisé, tomb 62 (Guiges 1938: fig. 59)--MB IIA-IIB, shape similar to parallel from Megiddo, monochrome red circles and bands of almost the same width.

Majdalouna, tomb (Chéhab 1940: fig. 6d)--MB IIA-LB IIA, overall shape similar to parallel from Megiddo, bichrome?

The concentric-circle motif, sometimes occurring as concentric spirals, is one of the most characteristic features of LPW, especially for jugs and juglets (below). The three almost complete vessels which parallel JH831 (Pl. 11a) are of the handleless jar type. Judging from its narrower neck and the more horizontal shoulder, JH831 was most likely a jug; Bietak 1991a: 33 describes it as a jug of Syrian type. The full-field decoration, on the other hand, would appear to leave little space for a handle, but an excellent parallel is reported from a tomb at Megadim (S. Wolf, personal communication).

2) bichrome triangles (a dark brown design bordered by light red bands): JH893 and MB029 (Pl. 12b), both MB IIA

Megiddo, tomb 911 A 1 (Guy 1938: pls. 28.44 and 117.2) --different rim, triple-stranded handle, monochrome red standing triangles and "collarette" (the latter was said to be "too indistinct for complete illustration," but it was observed on the example in the Rockefeller Museum, no. 3061/34.1677).

Gesher, tomb 13 (Garfinkel and Bonfil 1990: fig. 5.2)--different rim, standing and pendant solid red monochrome triangles on either side of a criss-crossed band.

Tell 'Amr, tomb 1, 2, or 4 (Amiran 1969: photo 106; Druks 1982: fig. 3.10)--different rim, pendant triangles on upper mid-body, light red design bordered by darker bands.

All of the cited parallels have monochrome, rather than bichrome, designs. The Tell el-Dab`a examples, especially MB029 (Pl. 12b), are characterized by distinct bichrome triangles set off from a light-colored surface. Solid triangles might also be compared to the many examples of triangles filled with diagonal and criss-crossed lines in the Khabur and Syro-Cilician corpora (also compare the famous Tel Aphek/Ras el-`Ain jugs--Ory 1937: pl. 25.77, 89 and 90-- below).

3) bichrome horizontal bands

a) with broad black bands bordering thin, separated red bands (band-zones): MB016 (Pl. 11e), MB IIA

Tel Aphek/Ras el-'Ain (Illife 1936: 123.29)--monochrome black bands (possibly bichrome) on a white slip.

Tel Nami, tomb (Artzy 1995: fig. 2.4, 1st row, 2nd from left)–complete jar.

Nahariyah (Ben-Dor 1950: fig. 47)--miniature, bichrome bands on shoulder.

Kabri, tomb 990 (Gershuny 1989: fig.14.3)--small jar.
(Ilan 1996: fig. 2.3)--fragment, narrow band-zone.

Beirut, Kharji tomb 1 (Saidah 1993-94: pl. 6.1a-b)–complete jar.

Sin el Fil, tomb (Chéhab 1939: fig.8c)--MB IIA-MB IIB, monochrome dark red bands over thin white slip on shoulder.

It should be noted that some of the parallels have only monochrome bands. Monochrome and bichrome band-zones also occur on dipper jugs (below). Simple horizontal bands are often combined with other motifs on LPW vessels.

b) with alternating dark brown and red bands: JH865, MB IIB

Ruweisé, tomb 56 (Guiges 1938: fig. 46)--mid-late MB IIA *apud* Gerstenblith 1983: 42), inner rim not as concave, band design more comparable to MB016 (Pl. 11e).

The almost intact jug is very similar in shape to red burnished jugs from MB IIA tombs at Megiddo (Loud 1948: pls. 10.1-13 and 16.1). Its gutter rim is comparable to those of MB011 and MB012 (below) and of Polished juglets (Cole 1984: sub-type Jp.41; see Chapter 3).

c) miscellaneous bichrome band design: JH915 and MB022 (Pl. 11g), MB IIA

Because of its small size, the design of JH915 is uncertain. MB022 also has dark brown tics extending between bichrome bands, and the painted decoration is highly polished, which is unusual for LPW. No parallels were found for MB022.

4) monochrome red criss-crossed lines: JH901 (Pl. 11b), MB IIA

Tel Aphek (Beck 1985: fig. 3.10)--no rim (but compare fig. 4.9-10) or handle preserved, wavy band above criss-crossed design.

Tel Ifshar (Paley and Porath 1997: fig. 13.6:4-5)–two jars with rims similar to MB011 and MB012 (see below).

Megiddo, =tomb 5114 (Loud 1948: pl.16.10; late MB IIA *apud* Gerstenblith 1983: table 5), Canaanite Jar, compare rim sub-type only.

Tell Sukhas, tomb IV (Thrane 1978: fig. 92.418)--jug with double-stranded handle, bichrome.

The rim sub-type at Tel Aphek, which is primarily associated with jars with rope appliqués (Beck 1985: 192; cf. Paley and Porath 1997: fig. 13.6:1, for Phase B at Tel Ifshar), is confined to MB IIA, and has disappeared by the latter half of MB IIA. However, at Tell el-Dab`a, Canaanite Jars and Polished vessels with this rim profile (Cole 1984: sub-type Jl.23--see Chapters 2 and 3) occur throughout the MBA.

5) monochrome red band on an interiorially and exteriorally profiled rim, forming a gutter or concavity around the interior of the vessel's mouth: MB011 and MB012, both MB IIA

Gezer (Dever , et al. 1986: pl. 2.12)--MB IIA-B, unpainted

Tel Aphek (Beck 1985: fig. 5.16)--unpainted.

Megiddo, tombs 5149, 5176, 5181, and E=5147 (Loud 1948: pls. 8.8, 12.22, 13.3, and 13.5)--variously sized, painted, and burnished.

MB011 and MB012 are very similar in shape. In her summary of the Tel Aphek phase 1 and 2 (early MB IIA) corpus, Beck (1985: 194) states that "medium-sized [handleless] storage jars with internally concave rim" are no longer present in phase 3 (late MB IIA). Yet, the continuation of such rims into later phases is attested by JH865 and Polished juglets at Tell el-Dab`a (Cole 1984: sub-type Jp.41--Chapter 3). The best parallel for the rim profile is the Gezer parallel, dated to MB IIA-B, which is not painted. It should also be noted that similar rims occur in the later MB levels (e.g., in stratum IX--Loud 1948: pl. 52.2, a painted Canaanite Jar with a criss-crossed line decoration like that of JH901, Pl. 11b).

6) monochrome red wavy band : MB015, MB IIA

Tel Aphek (Beck 1975: fig. 3.9; 1985: fig.3.10)--storage jars, with criss-crossed lines below on the latter example (compare JH901, above).

Another Tell el-Dab'a example (registration no. 6115H/D), not included in this study, has a similar design. Alternating horizontal straight and wavy bands are a common feature of LPW vessels, sometimes combined with concentric circles, criss-crossed lines, etc. The fabric of MB015 is finer than that of a Canaanite Jar, and its surface is burnished.

7) miscellaneous monochrome red geometrical design on shoulder: JH128, MB IIA, and MB020, MB IIA-B

No close parallels were found. The thick walls and rather coarse fabrics of the Tell el-Dab`a examples are comparable to those of JH901 and JH893 (Pl. 11b, and above), all of which may belong to large jugs or even Canaanite Jars (compare the "storage jars" at Tel Aphek--Beck 1975: fig. 3.9-10).

8) monochrome black horizontal bands on a red burnished surface

a) MB021, MB IIA

The single example was found together with another fragment (registration no. 3336G) from the same vessel, not included in this study, which has black painted half circles on a white surface below the horizontal bands. The design has no close parallels.

b) MB014, MBIIA

The two small fragments with thin black lines are paralleled by JH346 (below, under the pTeY class) and a complete jug from an MBIIA-B tomb at Tell el-Dab`a (registration no. 6096), not included in this study.

c) interiorally and exteriorally developed rim, forming interior and exterior gutters/concavities: MB018 (Pl. 11f), MB IIA

Gezer (Dever, et al. 1986: pl. 4.6)--MB IIA-B/MB IIB.

Tel Aphek/Ras el-'Ain (Ory 1937: fig. 58A)--Red Polished jug rim and neck; tomb 468 (Beck 1975: fig. 9.5)--biconical Red Polished jug
The horizontal burnishing of the painted rim and the vertical red burnishing on the neck suggest that the whole vessel was polished. The closest parallel to the rim shape

is indeed a Red Polished juglet from Dab`a itself--JH358, dated to MB IIA-B (Cole 1984: sub-type Jp.44--Chapter 3). An MB IIA jar/jug type, such as the Tel Aphek parallel or similar jugs from Megiddo (Loud 1948: pl.10.1-11), is also possible.

LPW Jugs/Pitchers

1) bichrome criss-crossed lines: MB027 (Pl. 11g), MB IIA

Dharat el Humraiya, tomb 62 (Ory 1948: fig. 37, pl. 32.1)--red slipped, burnished?, monochrome black design, criss-crossed lines, no additional decoration on shoulder.

Tel Nami, tomb (Artzy 1995: fig. 2.4, far right)–circle segments filled with lines on shoulder.

Amrith, tomb/silo 7 (Dunand,, et al. 1954: pl. III; Tubb 1983: fig. 1.4)--no additional decoration on shoulder.

MB027 appears to have part of a "braid" (i.e., a band alternately contracting and expanding) above the criss-crossed lines. A similar "braid" design occurs on Tell el-Yahudiyeh juglets from Sin el Fil (Chéhab 1939: fig. 7a) and Tell el-Dab'a (registration no. 7598C, surface context). Another possibility is that decoration is comprised of circle segments, similar to the Tel Nami parallel, as well as jugs from Ras Shamra (Schaeffer 1949: fig. 99.27) and Tel Ifshar (Paley and Porath 1997: fig. 13.5:6). MB027 has no handle, neck or base preserved, but the almost spherical body and the decoration make it very probably a jug/pitcher like the parallels with spheriform or elongated ovoid bodies, long necks, and handles attached from the mid-necks to shoulders. Gerstenblith (1983: 64-70) has discussed the relationship between these kind of jugs and the Syro-Cilician jugs of the north (Tubb's Amuq/Cilician class).

2) bichrome concentric circles: JH839, MB IIA. The curvature of the small sherd suggests that this example derives from a jug/pitcher.

Tel Ifshar (Paley and Porath 1997: fig. 13.5:2)–complete globular jug, stepped rim, triple hand, and disk base.

Lébéa, tomb 1 (Guiges 1937: fig. 3a)--MB IIA?, triple-stranded handle, pinched rim, bichrome design.

Sin el Fil, tomb (Chéhab 1939: fig.8a)--MB IIA?, monochrome red design.

Jars with concentric circles, a common motif on LPW vessels, have been discussed above. The design is even more prevalent on juglets, as follows:

Tel Ifshar (Paley and Porath 1997: fig. 13.5:2)--spheriform body, interior gutter rim, double-stranded handle, button base.

Tel Aphek, tomb 43 (Beck 1975: fig. 14.8 and pl. 12.10)--interior gutter rim, triple-stranded handle, small disk base.

Megiddo, =tomb 4010 (Loud 1948: pls. 19.33 and 119.16)--piriform body and small flat base.

Amrith, tomb/silo 4 (Dunand, et al. 1954: pl. 3. 2; Tubb 1983: fig. 1.3)--spheriform body, interior gutter rim, and possible double-stranded handle.

Ras Shamra (Schaeffer 1949: fig. 100.26)--ovoid body, stepped rim, double-stranded handle.

3) miscellaneous bichrome design: MB031, MB IIA

No close parallels exist for this example, apart from a Tell el-Dab'a sherd (registration no. 5226G) which is not included in this study. Possibly, MB031 shows part of a "butterfly" pattern separated by vertical lines, similar to the monochrome motif on the bowls and pitchers of the Syro-Cilician ware (Tubb 1983: 50-52). A bichrome example with smaller "butterflies" is attested at Tel Dan, and is a common motif on Monochrome Painted Cream Ware there (Ilan 1996: 162, figs. 3.5 and 6.1, 4).

LPW Dipper Jugs

1) bichrome broad black bands bordering thin red bands (band-zones): MB025, MB IIA

Gezer, tomb 3, III 30 (Macalister 1912: fig. 158.6)--uncertain context and dating, with painted "collarette" design.

Tel Aphek/Ras el-`Ain, tomb 5 (Ory 1937: pl. 30.3)--with painted "collarette" design.

Barqai, tomb (Gophna and Sussmann 1969: fig.4.3--MB IIA?, painted tics on rim and handle.

Tell Sukhas, Tomb IV (Thrane 1978: figs. 82.337 and 88.408)--broader neck and "collarette" design for former example, and painted oblique tics in zones on shoulders of the latter examples.

Ras Shamra, Schaeffer 1949: figs.106.11 and 100.13-14--two red bands around lower neck of first example cited, and painted "collarette" below the lower black band on shoulder of second example.

Another MB IIA example (registration no. 3360F) from Tell el-Dab'a, not included in this study, is almost identical.

2) monochrome horizontal broad bands bordering thin bands (i.e., band-zones): JH838, MB IIA

Tel Aphek/Ras el-`Ain, tomb 2 and 5K-390 (Ory 1937: nos. 45A, 80-82)--variable sizes, painted tics on handle and rim.

Beirut, Kharji tomb 2 (Saidah 1993-94: pl. 9.2; 11.1)–

"collarette" and painted tics on former example, and horizontal band on neck of latter.

Byblos (Dunand, 1954: fig.406.10882)--smaller size, no additional band below band-zone.

Ras Shamra (Schaeffer 1949: fig. 99.22)--smaller (12cm), with "collarette" design.

3) monochrome horizontal bands, possibly band-zone: MB033, MB IIA

The curvature and stance of this example indicates that its design was placed at mid-body, like band-zone designs, and probably it also derives from a jug type.

Horizontal band-painted dipper jugs and juglets (below) are found in numerous varieties at many Levantine sites (Gerstenblith 1983: 65-66). Presently, Tel Aphek/Ras el-'Ain provides the best parallels for the shape, base, and monochrome band-zone design of JH838, while MB025, with its bichrome design, is closest to examples from Ras Shamra. Comparable jugs from Megiddo typically have only one broad red band (Loud 1948: pls. 11.18-19, 22; 16.4-5; and 20.6-7; and Guy 1938: pls. 29.2-4 and 35.5-6), and bichrome examples (Loud 1948: pl. 11.21) are rare.

LPW Juglets

1) bichrome thick black bands bordering thin red bands (band-zones): MB028 (Pl. 12a; red lines are clearly visible below the lower black band), MB IIA

Kahun (Petrie 1891: pl. 1.11; Merrillees 1973: fig.1)--late Dynasty 12?, very thick sidewall.

Tel Ifshar (Paley and Porath 1997: fig. 13.5:1)–concentric circles (cf. above).

Amrith, tomb/silo 4 (Dunand, 1954: pl. 3.2, front middle; Tubb 1983: fig. 1.3)--with double-stranded handle?

Ras Shamra (Schaeffer 1949: figs. 99.23 and 100.23 and 26)--wavy band above band-zone of third example, probably not double-stranded handles for first and second examples, monochrome design on second example.

A trace of paint at the top edge of MB028 suggests that a "collarette" once existed here, along the lower neck. The star-like small mark to the right of the handle is unique. Some of the parallels have a concentric-circle design below the band-zone. MB028 is approximately contemporaneous with late MB IIA bichrome juglets from Tel Dan, including examples with concentric circles (Ilan 1996: figs. 4.2-3).

Miscellaneous Painted vessels

1) JH837 (Pl. 11c), MB IIA

The closely spaced dark red/brown line design of JH837 and its narrow mouth are suggestive of the rilled and/or painted decoration on EB IVA-B cups/goblets of inland Syria (see Mazzoni 1985). The sidewalls of this example, however, are more inturned than a cup/goblet, and no close parallels were found.

2) JH905, MB IIA?

Although the fabric of JH905 was described as type I-d (Nile D in the Vienna System), which is reddish-brown in color and characterized by moderate amounts of fine-coarse quartz and medium-sized calcite particles (0.3-1 mm in diameter), the NAA results indicate that it is an import from Southern Palestine. The incised and red painted design is unique, and the vessel, possibly a bowl jar/jug, may represent an innovative late MB IIA product that combines incising, like that for Tell el-Yehudiyeh ware, and painting, like that for LPW (compare the Dolphin Vase--McGovern, et al. 1994).

3) red painted and burnished horizontal bands: MB013 (Pl. 11d) and MB023, both MB IIA

These shoulder sherds, which are also represented by other Tell el-Dab`a sherds not included in this study, differ from the examples already discussed in being made of Nile alluvium mixed with coarse sand (fabric Ie, according to the Vienna System--Bietak 1991b: 326, 330). In its softer variant, this fabric is typically used for cooking pots (Aston 1996: 5). Horizontal polishing was restricted to the painted bands, whereas the rest of vessel was less well burnished vertically.

Miscellaneous MB IIB and IIB-C Painted Vessels

1) jug with monochrome red oblique lines on shoulder: JH380, MB IIB

Hama, tomb II (Fugmann 1958: pl. X.5B901; Ingholt 1940: pl. 17.5)--MB IIA-B *apud* Nigro 1997, very similar, but possibly slipped (according to the register in the Copenhagen National Museum) unlike JH380.

Ras Shamra, tomb LXXXV (Schaeffer 1949: fig. 108.22)--broader neck, bichrome (also note that oblique lines occur on other jugs--e.g., Schaeffer 1938: figs. 6E and 26Z).

Oblique and vertical lines, often occurring in groups, are common on the shoulders of Syro-Cilician jugs/pitchers, with animals filling the metopes. Gerstenblith (1983: 64-65, fig. 21.2) assigns the Ras Shamra parallel to her broad group of "regional variations" of the Syro-Cilician "eye" jug. Nigro (1997), as mentioned above, distinguishes an inner Syrian ware which has a monochrome metopic shoulder decoration but lacks the animal designs of the Syro-Cilician ware.

2) stepped rim juglets, with monochrome red oblique lines on shoulder, small ring-base, and triple-stranded handle: JH822, MB IIB-C

Tel Aphek, tombs 436 and 427 (Beck 1975: 72, n. 6, fig. 11.4)--latter example is unpainted, with traces of red slip; former example, referred to in a footnote, has painted bands and probable circles.

Kefar Szold, tomb (Epstein 1974: fig. 1.6-7)--MB IIA-B, spheriform body and concentric-circle design for former example; shoulder decoration? on latter example.

Ginosar, tombs 1 and 4 (Epstein 1974: figs. 5.10 and 14.1-3 and 5)--MB IIA-B, various designs including "branches," criss-crossed line metopes, concentric circles, "ladders," ibexes and a bird, and stippled triangles.

Qubbet Qar`a, tomb/Golan Dolmen No. 23 (Epstein 1985: fig. 5.18 and 20)--MB IIA-B through LBII, former example has ladder design and no base, latter example has horizontal bands on upper mid-body, vertical straight and wavy bands on shoulder, and lacks rim and base (cf. Hazor example, below).

Hazor (Yadin 1958: pl. 121.16; cf. pl. 121.14 and 17)--MB IIB, horizontal straight and wavy bands on mid-body, vertical bands on shoulder, no base (in addition to one of the Qubbet Qar`a parallels, above, registration no. 3582 at Tell el-Dab`a, not included in this study, is very comparable).

Tel Dan, tombs 1062, 4663, and 8096 (Ilan 1991: figs. 1.1, 2, and 4)--MB IIB, spheriform bodies and horizontal bands on first example, concentric circles on second example, and concentric spirals on third example.

Ruweisé, tomb 66 (Tufnell 1975-76: fig. 2.8-10)--MB IIA-B, various designs include straight and wavy bands (similar to that of pTeY, below), herringbone bands, and "collarette"; first and second examples with double-stranded handles, and spheriform body for third example.

Majdalouna, tomb (Chéhab 1940: fig.3c-d, f)--MB IIA-B through LB, concentric-circle design, "collarette" on second example.

Kamid el-Loz, tomb 97 (Hachmann 1982: pl. 23.3)--MB IIA-B, spheriform body, spiral and dot design.

Sin el Fil, tomb (Chéhab 1939: fig.7a)--MB IIA-B rim deeply stepped (compare those on black burnished flasks from the inland Syrian sites of Hama [Fugmann 1958: pl. 10.5B683] and Ebla [Nigro 1997: fig. 6.5]), metopic design.

The "stepped rim" (Cole 1984: sub-type Jp.21) or, if it is more flaring, the "candlestick" rim (Epstein 1974; Beck 1975 and 1985; Ilan 1991) is well-attested for Polished juglets (Chapter 3) and Tell el-Yahudiyeh juglets at Tell el-Dab`a (e.g., Kaplan 1980: figs.24c and 27c; Bietak, Hein, et al. 1994: 232, catalogue no. 283). Painted varieties at many sites are decorated with concentric circles or spirals, as was also typical in MB IIA for LPW which is usually bichrome. JH822 departs from the norm in having oblique lines on the shoulder arranged to form triangles, which are possibly related to the filled triangles of Khabur Ware (Hrouda 1957: 24-25, pl. 9.9c; Amiran 1969: pl. 35; Gerstenblith 1983: fig. 19.8-9), but, more likely, represent an adaptation of the oblique metope design of the Syro-Cilician tradition (above). Painted stepped-rim juglets from central Levantine sites share other stylistic motifs (e.g., the cross-filled metopes and animals on the Ginosar juglets) with those from more northern sites.

Almost all of the parallels for a Painted stepped rim juglet come from northern Palestininan and Lebanese sites, which points to a northern origin for JH822. The lack of an NAA provenience suggests that the example might originate from a Levantine region that is poorly represented in the database (e.g., the Galilee).

The MB IIB-C dating of JH822 is later than any of the cited parallels. As pointed out by Ilan (1991), the hypothesis that the Ginosar-type stepped rim juglets are an indicator of a transitional MBIIA-B date (Epstein 1974) is not certain. The monochrome painted stepped rim juglets evidently belong to a group that is later than most LPW and probably represents a regional development with ties to LPW and Syro-Cilician traditions.

3) jug with monochrome red horizontal bands: MB032 (Pl. 12e), MBIIB-C

According to the shape and thickness of this fragment, it probably belongs to a jug type.

4) miscellaneous juglets with monochrome black horizontal bands: JH826 and MB010, MB IIB; and MB019, uncertain context, questionable dating

The parallels cited for JH346 (see the pTeY class, below) also apply to the JH826, MB010, and MB019. JH826, which has a dark brown design on a cream surface, may also be compared to Cypriot White Painted (WP) V "eyelet" juglets (cf. Amiran 1969: 121, pl. 37.5-6, Åström 1972a: 219-20, fig. 16.14-16, and Maguire 1995: 55) or the "Syrian" prototype for the latter (cf. Schaeffer 1949: fig. 107.2--bichrome). Unlike the handmade Cypriot parallels, the Tell el-Dab`a examples are all wheel-made.

5) "collarette"--i.e., a horizontal monochrome band with vertical tics at the neck-shoulder junction: MB017 (Pl. 12d), MB IIB

MB017 is the only definite example of the "collarette" design at Tell el-Dab'a, and was made locally of Nile alluvial clay. Because of its later date and unusually large neck diameter, it might be interpreted as a native Egyptian motif rather than being related to LPW (Tubb 1983: 53; but also compare early New Kingdom motifs of similar type--Brunton 1930: pls. 28.117 and 31.268).

6) platter bowl with monochrome red horizontal band on rim: JH328, MB IIB-C

This type, both with and without a red painted horizontal band on the interior rim, is locally made at Tell el-Dab`a as early as MB IIA-B and continuing throughout the MBA (also see Chapter 5, and Bietak 1991b: fig. 48.5 and Bietak, Hein, et al. 1994: 237, catalogue no. 294). The Syro-Palestinian prototype, beginning in MB IIA, has better-proportioned sidewalls, and a well-defined flat or disk base and rounded interior-projecting rim (Cole 1984: Bp.21).

Tell el Maskhuta, tomb L2.2029 (Redmount 1989: fig. 164.6; Holladay 1982: pl. 41)--MB IIB-C.

Tel Poran (Gophna 1992: fig. 6.1)--"MB II," no base.

Tel Aphek, tomb 7 (Beck 1975: fig. 14.3)--ring base.

Megiddo, tomb 5178 (Loud 1948: pl. 14.5).

Tel Nami (Marcus 1991: fig. 36.1-2 and 4-5).

Painted Tell el Yahudiyeh (pTeY) juglets

Juglets with narrow necks and often with piriform bodies are very common in the tombs of the second half of the MBA. As summarized by Maguire (1995), the different types of juglets (incised, Painted, and Polished) were in ciculation all over the Levant, Cyprus and Egypt during this period. Some types (e.g., the painted stepped rim juglets, above) have well-defined geographic distributions. In particular, incised and white-filled Tell el-Yahudiyeh (TeY) juglets have been subjected to geographic analysis using stylistic and chemical methods (Bietak 1989a; Kaplan 1980). The painted variant of the Tell el-Yahudiyeh juglet (pTeY) is far less common than TeY, but is significant in being a local Egyptian development that combines LPW and Middle Cypriot painted traditions.

The color of the burnishing on pTeY juglets is distinctive, being either pale whitish/yellowish or red. The pale, light colored surfaces are painted with monochrome red/brown or darker brown/black designs, whereas the decoration on red burnished examples is confined to the brown/black variant.

1) piriform shape, with monochrome horizontal and wavy bands: JH318 (Pl. 13a), MB IIA-B; JH295 (Pl. 12c), MB IIB; JH907, MB IIB; and JH353, MB IIB-C

Buhen, Tomb H 40 (Randall-Maciver and Woolley 1911: pl. 49.10501)--Dynasty 18?

Tell el Yahudiyeh, tomb 14 (Petrie 1906: pl. 8B.98)--"Hyksos" period.

This is an extremely common sub-type at Tell el-Dab'a, accounting for an additional 12 published MB IIB examples (see Bietak 1968: fig. 8.392, 1984: fig. 15, 1985: fig. 15.9-15, and 1991a: figs. 123.1, 137.10, and 201.1; Van Den Brink 1982: fig. 11--described as Cypriot; and Bietak, Hein, et al. 1994: 227, catalogue no. 270) and many other unpublished examples, which are not included in this study. It should be noted that one of the published examples (Bietak 1968: fig. 8.392) has a stepped rim and was probably an import from Syria-Palestine (fabric type IV). In general, a single pTeY juglet is found in any given burial context, often with numerous Polished and Tell el-Yahudiyeh juglets (see, for example, Bietak 1991b: figs. 137-138), but one tomb at Tell el-Dab`a yielded seven nearly identical examples as well as one globular pTeY juglet (Bietak 1984: fig. 15.16).

2) piriform shape, with monochrome horizontal bands: JH317 and JH346 (Pl. 13b), both MB IIB

Gezer (Macalister 1912: pls. 142.10 and 153.6)--"Second Semitic" Period, ca. 1800-1400, three bands on upper body of former example.

Hazor (Yadin, et al. 1958: pl. 121.18 and 20)--five thin bands on the mid-body, triple-stranded handle, and button base for latter example.

JH317 is a standard Egyptian pTeY juglet, whereas JH346 is not made of Nile alluvial clay according to the NAA results. The latter is associated with stepped rim juglets at Hazor (see JH822, above) and Tell el-Dab`a (references cited in no. 1, above).

3) piriform shape, with monochrome straight and wavy vertical lines: JH897, MB IIB-C

Tell el Yahudiyeh (Petrie 1906: pl. 8A.67)--uncertain context, "Hyksos" period, no handle shown.

Vertical designs are generally applied to globular (as MB026, below) or bulbous-shaped bodies (see Bietak, Hein, et al. 1994: 227, catalogue no. 269, which is similar to a juglet from Tarkhan--Merrillees 1968: pl. 1.2). Another published parallel from Tell el-Dab'a (Maguire 1995: fig.10) has a band-handle (see above). WPPLS Cypriot influence is also evident for other Tell el-Dab`a examples (Maguire 1995).

4) globular shape, with monochrome vertical lines: MB026, B IIB-C
Buhen, Tomb K 45 (Randall-Maciver and Woolley 1911: pl.92.10886)--Dynasty 12?, more bulbous-shaped body, design probably straight and wavy vertical lines, band around lower neck.

5) globular shape, with monochrome concentric spirals: JH864 (Pl. 13c), MB IIB

JH864 is a locally produced Egyptian version of the juglet with concentric circles or spirals (above). It has a typical exteriorally developed rounded, everted rim (Cole 1984: sub-types Jp.21), which is common for Polished juglets (Chapter 3) and Egyptian TeY and pTeY juglets.

Cypriot Wares

1) White Painted (WP) V: JH916, MB IIB.

Cyprus (Åström 1972a: 76, 223, fig. 18.10)--Canaanite Jar.

Tel Mevorakh (Stern and Saltz 1978: fig.2)--Canaanite Jar.

Megiddo (Loud 1948: pl. 35.3)--Canaanite Jar/krater.

2) White Painted Pendent Line Style (WPPLS): JH899 (Pl. 7c), MB IIB

Cyprus (Åström 1972a: 28, 212-15, fig. 9.3-4).

Megiddo (Loud 1948: pl. 26.13 and 16, *passim*).

For other examples from the Levant, see Gerstenblith 1983: fig. 25.1-10.

3) bichrome (red burnished and unburnished black): MB030, MB IIB-C

This example has a close parallel from Tell el-Dab`a (registration no. 6114B), which is not included in this study. The decoration of red bands, which were horizontally burnished, and unburnished black bands is otherwise unknown and not common for Cypriot wares (L. Maguire, personal communication).

A fuller discussion of the Cypriot types and their significance can be found in Maguire 1995 (for more examples from the Levant, see Maguire 1990).

Bichrome Ware

1) Tell el-`Ajjul type: JH331 (Pl. 12f), MB IIC?

Lisht (Merrillees 1970: figure on p. 8)--uncertain context, *terminus post quem* in the late 2nd Intermediate Period,head of bird more horizontal, as is more common.

Tell el-`Ajjul (Amiran 1969: photo 143)--LB IA, head of bird more horizontal.

Megiddo (Loud 1948: pl.51.8)--LB IA, head of bird more horizontal.

2) Bichrome Cross Line style: PMG127 (Fig.127), early 18th Dynasty

For examples of jugs like PMG127, see Epstein 1966: pl. 3, *passim*, and Loud 1948: pl. 51.6-8.

Tell el-`Ajjul Bichrome Ware was first defined by Heurtley (1938) as exclusively made by a master potter at Tell el-`Ajjul, and then disseminated to other Near Eastern sites (see Epstein 1966). NAA has shown that the ware, with its very characteristic black and red geometric and animal motifs, was also produced on Cyprus and at Megiddo (Artzy, et al. 1973, 1975, and 1978). The Tell el-Dab`a examples provide the first direct evidence that it was also produced in Egypt from native Nile alluvial clay, which had been previously proposed by Merrillees (1970). Another example from Tell el-Dab`a is shown in Bietak, Hein, et al. 1994: 259, catalogue no. 354.

Kamares Ware: PMG108, MBIIA-B; PMG109, secondary context, MBIIA?; and PMG110, MBIIA. (Pl. 16)

For a general discussion of Kamares Ware, see Walberg 1987. PMG110 is specifically discussed by Walberg (1991) and Macgillivray (1995). PMG109 has been described as post-Kamares by Walberg (1991: 11) and Bietak (1995: 19), although she (Walberg 1978: 16, pl. 4. 205:6) also cites a parallel to a classical Kamares cup. A complete vessel from tomb LXXXVI at Ras Shamra (Schaeffer 1949: fig. 109; Bietak, Hein, et al. 1994: 209, catalogue no. 235) provides a good parallel for PMG110.

5. Summary

by **Tine Bagh**

The NAA results were somewhat unexpected, in view of the prevalence of some of the LPW types in the northern Levant. For the first half of the MBA, much of the Painted pottery, including early LPW, is imported into Tell el-Dab`a from the Gaza region of Middle Bronze Age sites (Southern Palestine). The lack of stylistic parallels from this region may, of course, be due mainly to the lack of excavated/published sites, especially MB IIA burials (note, however, Tubb 1983: fig. 1.5--Tell el-`Ajjul).

Tel Aphek/Ras el-`Ain is the most southern Levantine site that has yielded good parallels for the Tell el-Dab`a corpus. LPW is confined to the earliest MB IIA phases 1 and 2 of Tel Aphek. The bichrome cross-hatched triangle and lozenge designs on vessels from phase 1 (Beck 1985: fig. 3.7-8; Ory 1937: pl.XXV; also see below) do not occur at Tell el-Dab'a, but the decoration on a shoulder fragment from phase 1 (Beck 1985: fig. 3.10) is very similar to a monochrome criss-cross line design on JH901 (Pl. 11b) from MB IIA stratum d2 at Tell el-Dab'a. The thickened, folded rim on the flaring neck of JH901 is also comparable to rims of Tel Aphek's phases 1 and 2. A jar/jug fragment from the beginning of phase 2 with bichrome concentric circles is the best parallel for JH831 (Pl. 11a), which is also from stratum d2.

Based on the Painted vessel corpus, it may thus be concluded that Tell el-Dab'a's first MB IIA stratum, d2, is closest to Tel Aphek's phase 2 and probably even has some affiliations to the earliest phase at this site (Bietak 1991b and 1992: 32; Weinstein 1992: 28-29, 38).

Another MB IIA site that has provided good parallels for the Tell el-Dab`a corpus is Megiddo, where LPW decoration typically consisted of simple horizontal red bands, with the occasional bichrome design. Gerstenblith (1983:23-28) assigned the handleless jars with painted bands to her phase 1/2, which dates to the early MB IIA; painted pitchers and dipper juglets are said to continue into phase 3. Many of the Painted vessels were originally ascribed to stratum XIV, but have now been reassigned to stratum XIIIB (Kempinski 1989: fig.20).

The material from the important MB IIA site of Tel Ifshar has been published in preliminary reports (Paley and Porath 1997, including references to earlier reports). It is clear that LPW was prevalent there more or less during the same period that other pottery made of Egyptian marl wares, probably dating to the 12th dynasty, was imported. The early MB IIA phases have a similar artifactual repertoire as Tel Aphek's pre-palace phases 1 and 2, and the published painted vessels from Phases B and C of Area C include jugs, juglets and jars with concentric circles, cross-hatched triangles, criss-cross bands, etc. (Paley and Porath 1997: fig. 13.5-6). As was also the case at Tel Aphek, red slipped, burnished surface treatment had displaced painted decoration by Phase E (i.e., the second half of MB IIA).

The connections between Byblos and Middle Kingdom Egypt are well attested and often referred to (recently, Ilan 1995: 308), and Byblos has been claimed as the place of origin for the expansion of the MB IIA settlement at Tell el-Dab'a (in modified form--Bietak 1996:14). Byblos, however, has not provided any good parallels for the fine bichrome LPW of Area F, stratum d2 at Tell el-Dab'a, with the exception of a red painted dipper juglet (JH838). On the other hand, the predominantly monochrome red painted jugs and cups with alternating horizontal and wavy bands appear to have developed out of Early Bronze Age traditions (Tubb 1983: 53, also referring to two bichrome jugs which, however, do not accord with MB IIA decoration--Salles 1980: pl. 21:1-2; also see Bagh 1998).

The band-painted dipper juglets have especially good parallels at Ras Shamra. Most of the the latter examples are bichrome, and customarily include "collarettes" and neck bands. MB025 is very close to a Ras Shamra juglet (Schaeffer 1949: fig. 106.11), which is dated to Ugarit Moyen 2 (i.e., early MB IIA).

Together with Ras Shamra, the MB IIA tombs at Ruweisé and Majdalouna, in the Sidon area along the Lebanese coast, have a high concentration of other bichrome designs, such as the concentric circle/spiral motif. Such decoration is also attested at Tel Aphek, Megiddo, and Tel Ifshar, but thus far not in Southern Palestine. The best parallel for the jug/pitcher with bichrome criss-cross band design (MB027, Pl. 11g) is at the northern coastal sites of Tel Nami and Amrith.

Since the NAA results for many of the bichrome designs were inconclusive, it is possible that enlarging the database will eventually demonstrate that these LPW types originated from the northern Levant.

In MB IIA-B and MBIIB, the concentric circle/spiral motif is restricted to the "stepped rim" juglets of the Galilee and sites farther north. A juglet of this type, with a unique design (JH822), is of uncertain provenience and possibly provides a link to the same region in MB IIB-C.

JH380, which is here classified as belonging to the inner Syrian Common Painted Ware related to Syro-Cilician traditions (Nigro 1997) and which again is of uncertain provenience according to the NAA results, likely illustrates the general trend of more contact with inland Syria and the Orontes Valley region in MB IIB.

Kamares Ware provides minimal evidence of contact with Crete in MB IIA. Beginning in MB IIB, Cypriot wares become increasingly popular. What has been termed painted Tell el-Yahudiyeh (pTeY) Ware is a local Egyptian development, which was influenced by the White Painted (WP) styles of Cyprus (note especially, the vertical decoration on JH897 and MB026). A pTeY juglet with spirals (JH864, Pl. 13c), made of Nile alluvial clay, is also a good example of how Eastern Mediterranean styles were intermingled at this time: a Levantine motif on a Cypriot globular body, with an Egyptian-style rim and handle.

Although two Bichrome Ware examples (JH331, Pl. 12f, and PMG127) included in the corpus are poorly dated, they do provide proof that this ware was also produced in Egypt.

LPW apparently played a role in the upper class life of the emerging pre-Hyksos town at Tell el-Dab`a, since most of the LPW pottery was recovered from the large houses in area FI, dating to the earliest MB IIA stratum (d2) which was soon rebuilt as a major palace in stratum d1. Later in the MBA, and as more of the Painted pottery came to be produced locally of Nile alluvial clay, residential and burial contexts are about equally represented.

Macroscopic fabric assignments according to the Vienna System are generally in accord with the NAA results, as was the case for the other major pottery classes. Several examples were queried as being made of fabric type VI (Cypriot), but in only one instance was this conclusion borne out by the NAA results; the other examples were of uncertain provenience, and one was made of Nile alluvial clay. Fabric type IV, which is a Syro-Palestinian category, was also sometimes confused with Nile alluvial and Fayyum-Maadi marl clays.

In conclusion, the Painted wares from Tell el-Dab`a, ranging from LPW to Kamares Ware to pTeY and later

Cypriot and Bichromes Wares, fit well into the general chronological development of Painted types elsewhere in coastal and inland Syria-Palestine. Although the origin of some distinctive northern types is as yet uncertain according to the NAA analyses, the most prevalent Painted pottery at Tell el-Dab`a is from Southern Palestine. The stylistic influences of this region, as well as Cyprus, are also reflected in the development of locally made pTeY and other later MB types.

Chapter V

MISCELLANEOUS VESSELS

The Miscellaneous pottery group is comprised of 63 bowls, cups, flat-bottomed and hole-mouth cooking pots, small and large jars, a juglet handle, a beerjar, and a ring stand. Middle Bronze (MB) IIA and IIB are best represented in the NAA corpus, with approximately twice the number of samples than for MB IIA-B and IIC; only three MB IIB-C samples were analyzed (Tables 4 and 7).

1. Stylistic and Technological Overview

The five platter bowls which were analyzed are of Syro-Palestinian type and are variously dated within the MBA. Unlike the finely carinated and S-shaped Polished examples (see Chapter 3), they have thick irregular sidewalls, flat disk bases (Cole 1984: sub-type Bp.0.12) that were string-cut off a tournette, and plain flattened and inverted rounded rim profiles (Cole 1984: sub-types Bp.12, 51, and 52). The MB IIC (JH327) and MB IIB-C (JH342, Pl. 14a) bowls have overall red slips; an MB IIB-C example (JH328) of similar type has a red painted band around the interior rim, in essence a more restricted use of a liquid slurry which would otherwise be used to slip the whole vessel (also see Chapter 4).

An MB IIC bowl (JH292) with an inturned rim and internal projection belongs to the so-called "keeled bowl" class (Cole 1984: sub-type Bd B.21).

Two MB IIB round-bottomed cups (JH718 and JH719, Pl. 14c), with simple rounded rims, are Egyptian in inspiration. They were turned and finished off on a wheel. Their width-to-height indices average 115, indicating a fairly deep, narrow variety that is characteristic of this MB sub-period (Do. Arnold 1982: 60-62, figs. 17.11 and 18.8-9, 11; Bietak 1991a: fig. 14).

The 18 cooking pots, of which 14 are illustrated, belong to the two major Syro-Palestinian types of the period:

1) The handmade flat-bottomed type, with upright sides and usually everted (also inturned on JH793) and rounded rims (Cole 1984: Cf A.1-2), which are largely restricted to

TABLE 7
TYPOLOGY OF MIDDLE BRONZE MISCELLANEOUS VESSELS
AT TELL EL-DAB'A*

Description	Type	MB IIA	MB IIA-B	MB IIB	MB IIB-C	MB IIC	?
Deep Bowl	Bd B.21	0	0	0	0	1	0
int. rim projection							
Platter Bowl	Bp.12	0	0	1	0	0	0
plain, flattened rim							
Platter Bowl	Bp.51.21	1	0	0	1	1	0
inverted, rounded rim, flat disc base							
Platter Bowl	Bp.52.21	0	1	0	0	0	0
inverted, flattened rim, flat disc base							
Egyptian-style cup	-	0	0	2	0	0	0
Cooking Pot	Cf A	0	0	1	0	0	0
flat-bottomed							
Cooking Pot	Cf A.1	2	0	0	0	0	0
flat-bottomed, holes above molding							
Cooking Pot	Cf A.2	2	0	0	0	0	0
flat-bottomed, vestigial holes above							
Cooking Pot	Cf ?	0	1	0	0	0	0
flat-bottomed							
Cooking Pot	Ch.11/Bd C.31	2	2	0	0	0	0
holemouth, rounded rim							
Cooking Pot	Ch.12/Bd C.33	1	1	0	0	1	0
holemouth, squared rim							
Cooking Pot base	Cf A.0.11	0	1	0	1	0	0
flat-bottomed, flat disc							
Egyptian-style Beerbottle	-	0	1	0	0	0	0
Jar or Jug(let)	JJ.11	1	0	0	0	0	0
rounded rim							
Jar or Jug(let)	JJ.12	0	0	2	0	0	0
plain flattened rim							
Jar or Jug(let)	JJ.13	0	0	1	0	0	0
tapered rim							
Jar or Jug(let)	JJ.22	1	1	1	0	0	0
ext. flattened							
Jar or Jug(let)	JJ.31	1	0	0	0	0	0
ext. profiled, rounded							
Jar or Jug(let) base	JJ.0.11	0	0	0	0	1	0
plain flat	JJ.0.13	1	1	0	0	1	0
plain convex	JJ.0.11	0	0	0	0	1	0
Cypriote Pithos							
	-	0	0	0	0	1	0
Ring Stand							

*Three miscellaneous vessels in the follow-up NAA study are omitted from the tabulation.

MB IIA but continue down to MB IIB. Holes, which run around the top of the rim and might have served to allow gases to escape, are either punched entirely through the sidewall or vestigial (external depressions). None of the NAA specimens had rope appliqués preserved below the holes or depressions, but this standard feature of the type is attested on other examples from Tell el-Dab`a. A flat disk base (JH282) belongs to this type.

2) The wheel-made round-bottomed, hole-mouth type (Cole 1984: Ch.11-12) that begins in MB IIA and continues to be made through the rest of the MBA. This variety is difficult to distinguish from a deep bowl or krater form, which also has an externally folded-over and rounded (sometimes flattened or squared) rim (Cole 1984: Bd C.1, 3). A rope design with criss-crossed incisions was applied to the shoulder of JH832 (Pl. 14d).

Fifteen Egyptian-style jars, of which 12 are illustrated, include the following:

1) A so-called beerjar (JH656) of standard early 13th Dynasty type has a rounded base and a high-collared, tapered rim, which is denoted as "kettle-shaped" (Bietak 1991a: 36, fig. 7) or gutter (Cole 1984: sub-type Jp.41; see Chapters 3 and 4, for numerous examples of Polished and Painted examples). The vessel was irregularly built up of coils, held together by rope (note the lines of regularly spaced impressions on the exterior), and roughly finished off by hand-smoothing and scraping.

2) An MB IIB miniature jar (JH345, Pl. 14e), is globular in shape with a high neck, round base, and everted rim with externally flattened edge (Cole 1984: sub-type JJ.12.13).

3) Four large jars were built up of coils and either finished on a tournette or by hand. An MB IIB "water storage jar" or *zir* (JH063) is of the standard bulbous or bag-shaped variety of early 13th Dynasty Lower Egypt (Delta). Note the slightly flattened, convex base and the everted and exteriorly flattened rim (Cole 1984: sub-type JJ.12.13; compare *Zir* 4 in Bietak 1991a: 36, fig. 9). An MB IIC globular form (JH616), lacking a rim, is most plausibly assigned to a later development of the same type (Bietak 1991a: 44-46, figs. 9.*Zir* 5 and 10, *passim*).

Two Middle Egyptian (Fayyum-Maadi region) jars (*zirs*), which have rough finger marks on their interiors as a result of the fabrication process, are also part of this group:

1) An MB IIA example (JH658, Pl. 15a) that is bag-shaped with a rounded base, multiple profiled rim and neck (Cole 1984: sub-type JJ.31.11), and an incised trident-like mark (an inverted bisected semi-circle).

2) An MB IIA-B example (JH704, Pl. 15b) that has an elongated globular shape, with an externally folded-over and squared-off rim and slightly flattened base (Cole 1984: sub-type JJ.22.11; compare Bietak 1991a: 36, fig. 8).

Other rim types, probably belonging to the same general jar classes already described, are rounded or tapered and everted (Cole 1984: sub-types JJ.11 and 13; e.g., JH660 and JH664). Plain flat and convex bases (Cole 1984: sub-type JJ.0.11 and 13; JH659, JH674, and JH679) very likely also belong to Egyptian-style jars, although jug types cannot be ruled out. A juglet rim and base were also analyzed, but are not illustrated in this volume. Numerous other body sherds of uncertain type were included in the NAA corpus, primarily because of their macroscopic fabric assignment. Two unique body sherds (JH804), with finger impressions, belong to a Cypriot vessel according to the NAA results (below).

A large handleless jar or pithos (JH909, Pl. 15c), with a flat base and well-defined shoulder that is bordered above by three incised horizontal lines, is taller and larger than the average Canaanite Jar at Tell el-Dab`a (Chapter 2), and probably had a volumetric capacity of ca. 40 l.

A ring stand (JH339, Pl. 15d), used to support amphoras in an upright position, is of a standard Egyptian type, although also attested in Syria-Palestine. It has a low, concave form. Generally, clay coils are used to build up the cylinder, which is then finished off on a tournette with rims being folded over to the exterior and rounded off on the top and bottom.

2. Neutron Activation Analysis Results

The proveniences of the pottery in the Miscellaneous group, according to the NAA analyses, can very nearly be predicted on the basis of the pottery type and/or its fabric. Definite Egyptian types--cups, Lower Egyptian type *zir*'s, a beerjar--and what one would expect to be of local manufacture--viz., cooking pots and a ring stand--are indeed made of Nile alluvial clay of probable local origin. One of the flat-bottomed cooking pots (JH126), however, was of uncertain provenience, suggesting that it was imported.

The macroscopic fabric assignments of the Egyptian and other utilitarian pottery types, whether sub-types I-a, I-c, I-d, I-e2, or I-e3 (see Chapters 2 and 3, for nomenclature and definitions), are in close accord with the NAA findings. A cup (JH718, Pl. 14c), also made of Nile alluvial clay, was incongruently classified as made of a II-c marl clay (from the Fayyum-Maadi region). The fabric of the MB IIC globular jar of Egyptian type (JH616) was denoted as I-e2, and yet it is made of Southern Palestinian red loess clay according to the NAA results; it is the only unquestionably imported vessel from the Levant in the group. It should be stressed, however, that nearly all the Syro-Palestinian pottery types--bowls and cooking pots--were classified as Nile alluvial fabric sub-types and confirmed as such by NAA. It is not surprising then that the relative percentages of imported and Egyptian-made pottery in the Miscellaneous group is the reverse of what it is for the other Syro-Palestinian classes during the first half of the MBA (Fig. 25) Egyptian clays--whether the locally available alluvial clay or the higher quality marl available in the Fayyum-Maadi region--were used almost

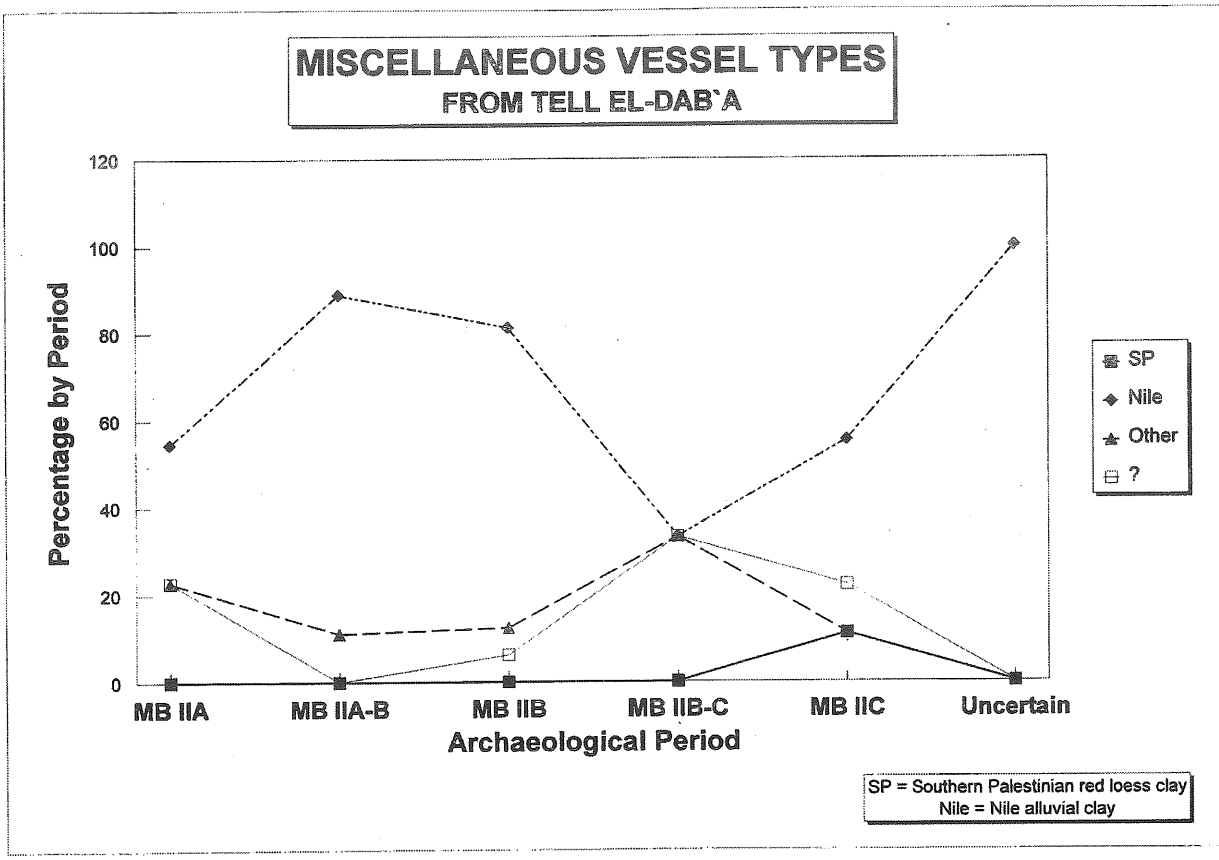

Fig.25: Relative percentage of Miscellaneous pottery vessels made of Southern Palestinian red loess, Nile alluvial, and other clays at Tell el-Dab`a, for each sub-period of the Middle Bronze Age. Samples with uncertain proveniences (?) are also shown.

exclusively to make these utilitarian vessels throughout the MBA.

The Middle Egyptian jar or *zir* types, both whole vessels and sherds, were uniformly assigned to fabric sub-type II-c, and this conclusion was confirmed by NAA (except for JH767, not illustrated). This fabric derives from the an Upper Eocene marl clay deposit that extends from north of the Fayyum oasis in a southeastwards direction towards Maadi on the east bank of the Nile.

Almost all the Miscellaneous pottery examples which were classified as being imported Levantine clays are of uncertain provenience, including the common fabric sub-types IV-2-b-c as well as the less common sub-types IV-1 (more reddish) and IV-3 (more yellowish). As discussed in Chapter 2, random variations in clay beds, potting traditions, and analytical precision may partly account for this result. The "keeled bowl" (JH292), although of questionable provenience, is closest chemically to an import from Southern Palestine.

Cypriot imports to Tell el-Dab`a increase during the last half of the MBA. Two of the Miscellaneous vessels--a pithos (JH909, Pl. 15c) and body sherds with a finger-impressed design (JH805)--were classified as IV-2c and IV-3c fabrics, respectively. Both examples were imported from Cyprus.

3. Archaeological Contexts and Uses

The Miscellaneous vessel types were recovered from contexts that are in accord with their presumed uses (also see Chapter 1 and Table 1). Thus, all the cooking pots (with the single exception of JH607, not illustrated), all the "water storage jars" or *zir*s, a ring stand, and a beerjar were from residential contexts. Two of the flat-bottomed cooking pots (JH126 and JH127) were from the same refuse pit in the MB IIA palace in area FI (square l/20, pl. 2-3), which also included Canaanite Jar imports from Tell `Arqa in inland southern Lebanon (JH120), possibly from Kamid el-Loz in the same region (JH122), and Tell Mardikh/Ebla in inland Syria (JH121) (see Chapter 2). Although one of these cooking pots was of Nile alluvial clay and most likely locally made, the other (JH126; also see above) was the only cooking pot in the NAA corpus that was imported, although from where is uncertain. A cooking pot of Nile alluvial clay (JH766) and a jar or *zir* (JH767) of marl clay from the Fayyum-Maadi region were also found together in a possible MB IIA residential context of the palace.

Other Miscellaneous vessels--viz., the platter bowls, cups, the Cypriot imports and a miniature jar (JH345, Pl. 14e)--were confined to burials in areas AI, AII, AIII, and FI. These vessels might have been used in burial rites, or have been of some special significance. Because of its large

size, the Cypriot pithos probably was originally used as a container, and secondarily deposited in the tomb. Except for the Cypriot examples, all the Miscellaneous vessels from burial contexts were made of Nile alluvial clay, whether of Egyptian type (cups and miniature jar) or Syro-Palestinian type (platter bowls). The two Egyptian cups (JH718 and JH719, Pl. 14c) were found in an MB IIB tomb of area AII, together with four Polished juglets which were confirmed to be of Nile alluvial clay by NAA.

4. Stylistic Interrelationships and Cultural Importance

On the basis of the very close typological parallels from well-stratified and well-dated contexts cited below, Miscellaneous vessels of Syro-Palestinian type--platter bowls and cooking pots--can be seen to be best represented at coastal sites, extending from Sinai and Southern Palestine northwards to Byblos. Parallels from inland sites of the region (e.g., Moza, Jericho, Shechem, Kabri in the Galilee, and Tell es-Salihiyeh in southern Syria) are less exact and generally date to MB IIB or later. Northern coastal and inland Syrian sites are noticeably absent from the listing. Even an MB IIC "keeled" deep bowl in the corpus (JH292), which is a type that has been argued to show stylistic influence from the middle Orontes Valley region (Fugmann 1958: figs. 109-110, 117, 120, 124 and 127, *passim*), finds its best parallel with an early MB IIA example from Tel Aphek. In addition to Tel Aphek, other sites in the plain of Sharon and southern coastal plain, which have been well published, provide many of the parallels to the Tell el-Dab`a pottery in the NAA corpus.

The Egyptian pottery types--cups, jars and a beerjar--are well discussed by Bietak (see 1991a, for a short overview of the evidence). Except for several parallels at Levantine sites, which were in contact with Egypt (Byblos, Kamid el-Loz, the Sinai, and Southern Palestine), the vessels in the NAA corpus belong to the standard Lower and Middle Egyptian pottery repertoires. Ring stands, although no close parallels were found for JH339 (Pl. 15d), are also more common in Egyptian than Syro-Palestinian MB contexts.

Typological *Comparanda*

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
Platter Bowls	
JH327	f. JH342 (Pl. 14a) Calalakh (Woolley 1955: pl. 109.3) Jericho (Kenyon 1960: fig. 115.1--rectilinear incisions on base, well-defined disk base; 1965: fig. 95.1, 7, *passim*) Kabri (Kempinski and Niemayer 1990: fig. 19.3)--red slipped int. and over rim Megiddo (Loud 1948: pl. 14.5) Shechem (Cole 1984: pl. 3b)--red painted band around rim Tell es-Salihiyeh (von der Osten 1956: pl. 43/fig. 95. (TS) 195)--not slipped and burnished, disk base
JH342 (Pl. 14a)	Jericho (Kenyon 1960: fig. 115.2)--well-defined disk base
JH677	Megiddo (Loud 1948: pl. 37.18) Shechem (Cole 1984: pl. 1b)
JH861 (Pl. 14b)	Bat Yam (Gophna and Beck 1981: fig. 8.7) Beth Shemesh (Grant 1929: 125, nos. 654, 659) Byblos, tombs I-III (Tufnell 1969: fig. 3.20) Megiddo (Loud 1948: pl. 14.9) Moza (Sussmann 1966: fig. 2.1)--concave disk base Shechem (Cole 1984: pl. 2i) South of Dor (Gophna and Beck 1981: fig. 2.7) Tell el-`Ajjul (Tufnell 1962: fig. 10.12) Tel Mevorakh (Stern 1984: fig. 12.25) Tell es-Salihiyeh (von der Osten 1956: pl. 42/fig. 95. 67, pl. 43/fig. 96.198--not slipped and burnished, more pointed and int. developed rim
Deep Bowl	
JH292	Tel Aphek (Beck 1975: fig. 2.6)--Phase 2/mid-MB IIA
Cup	
JH718 (Pl. 14c)	Cf. Byblos, tombs I-III (Tufnell 1969: fig. 2.2)
Flat-bottomed Cooking Pots	
JH127	Cf. Gezer (Dever 1986: pt. 2: pls. 4.15 and 22, 6.11

NAA no.	*Site or Tell el-Dab`a Sample—Comments and/or Dating*
	Cf. Ramle (Gophna and Beck 1981: figs. 5.9-12, 6.1-4)
	Cf. Revadim (Gophna and Beck 1981: fig. 11.20-23)
	Cf. Shechem (Cole 1984: pl. 23a-b)
	Cf. Sinai (Oren, unpublished report, nos. 18601, 18616, 18617, etc.)--many without rope appliqués
	Cf. Tel Aphek (Beck 1975: figs. 1.2, 2.16)
	Cf. Tel Ifshar (Paley, unpublished report, Basket 5969, Locus 1111)
	Cf. Tell Qiri (Ben-Tor and Portugali 1987: fig. 62.1-3)--undecorated rope appliqués
JH832 (Pl. 14d)	Cf. Nahariyah (Ben-Dor 1950: pl. 7, *passim*)--on "incense burners"
	Shechem (Cole 1984: pls. 10h, 26c)
	Tel Mevorakh (Stern 1984: fig. 13.12)--only incised rope designs
Hole-mouth Cooking Pot or Deep Bowl	
JH675	Cf. Shechem (Cole 1984: pl. 32b)
	Cf. Tel Aphek (Beck 1985: fig. 2.8)--only rim
	Tel Mevorakh (Stern 1984: fig. 13.10)
Hole-mouth Cooking Pots	
JH754	Tel Burga (Kochavi, et al. 1979: fig. 11.4)--squared-off rim
JH778	Megiddo (Loud 1948: pl. 46.7)
	Sinai (Oren, unpublished report, no. 18991)
Beerjar	
JH656	Kamid el-Loz (Hachmann 1969: pls. 10.1, 11.2 and 4)--overall form close, different rim profiles, ridge below rim, better-made
Jars	
JH345 (Pl. 14e)	Cf. Beth Shemesh (Grant 1929: 153, no. 319)--full-sized
JH658 (Pl. 15a)	Sinai (Oren, unpublished report, no. 19008)--different rim profile

5. **Summary**

The Miscellaneous pottery group of the NAA corpus presents a very consistent picture:

1) Individual vessels can be readily assigned to stylistic types from specific geographic regions: Syro-Palestine (platter bowls and cooking pots), Lower and Middle Egypt (cups, jars and a beerjar), and Cyprus (pithos and finger-impressed sherds). The best parallels for the Syro-Palestinian types are from southern and mid-coastal sites.

2) With few exceptions, the macroscopic fabric assignments, according to the Vienna system, were borne out by the NAA findings.

3) Because of the utilitarian nature of this group, most examples--including the Syro-Palestinian types--were either produced locally of Nile alluvial clay or were made of the excellent marl clay available in the Fayyum-Maadi region and transported about 100 km to Tell el-Dab`a.

4) The utilitarian character of the group was further emphasized by where the vessels were found. Whereas the cooking pots, "water storage jars" or *zir*s, and a beerjar and ring stand of everyday life were recovered exclusively from residential or palace contexts, more unusual vessels--a miniature jar, platter bowls, cups, and a Cypriot pithos--came from tombs.

5) The only import from Southern Palestine was a globular jar of Egyptian type.

6) One cooking pot in the NAA corpus was possibly imported, since it is of uncertain provenience. It was found together with amphoras from Lebanon and possibly Syria in a refuse pit of the MB IIA palace in Area FI.

The implications of these findings are dealt with in greater detail in Chapter 6.

Chapter VI

CONCLUSIONS AND SYNTHESIS

This NAA study of Syro-Palestinian pottery types found at Tell el-Dab`a/Avaris is important for the perspective it provides on economic and social developments at what has been identified as the capital of the "Hyksos" in the northeastern Nile Delta during the period from the late Middle Kingdom through the Second Intermediate Period.

1. Local and Imported Pottery at Tell el-Dab`a: An Overview

The general results for each major pottery class--Canaanite Jars/amphoras, Polished, Painted and Tell el-Yahudiyeh wares, and Miscellaneous types--are summarized by their geographic origins in Figures 26-29. These tables show the relative percentage of each class, sub-period by sub-period, throughout the Middle Bronze Age (MBA). Thus, of the imported pottery coming from the "Gaza group of Middle Bronze Age sites" in Southern Palestine (Fig. 26), Canaanite Jars overwhelmingly dominate the picture for the entire period, never declining below 60% and even accounting for all the imports from this region in MB IIB-C. Polished vessels from Southern Palestine show a slight increase from MB IIA to MB IIB, even exceeding 20% of the imports, but disappear after MB IIB. Imported Tell el-Yahudiyeh pottery, which does not constitute a large percentage in any sub-period, progressively declines in numbers in the early MB sub-periods, and also is absent from the corpus after MB IIB. Levantine Painted Ware is imported from Southern Palestine at about the same level as the Polished wares in MIIA, falling off more rapidly thereafter, but showing a resurgence in MB IIC.

Syro-Palestinian pottery types made of Nile alluvial clay are already present in the earliest MB IIA levels at Tell el-Dab`a (Fig. 27). These vessels were probably locally manufactured, because of their chemical comparability to modern clays in the region. Macroscopically, these vessels are identical to the Southern Palestinian imports in their stylistic and technological features. Polished pottery was a major focus of imitations throughout the MBA, whereas Canaanite Jars show a steady increase from sub-period to sub-period. Painted and Tell el-Yahudiyeh wares were also duplicated to an ever greater extent, but are completely absent from the MB IIC corpus. Miscellaneous pottery constitutes a high percentage for each sub-period, because many are standard Egyptian-style cups and jars or utilitarian types (e.g., cooking pots).

A very small number of samples in the Tell el-Dab`a NAA corpus were made of clays other than the red loess of Southern Palestine or Nile alluvial clay (Fig. 28). A total of twelve vessels (2% of the entire corpus of 608 examples), dating to all sub-periods of the MBA, were made of the fine Upper Eocene marl clay exposed in the Fayyum-Maadi region, about 100 km to the south of Tell el-Dab`a, viz., 2 Canaanite Jars, 2 Polished juglets, and 8 Miscellaneous jars ("water storage jars" or *zirs*). Only four vessels (0.7%)--an MB IIA Canaanite Jar from Tell `Arqa on the northern coast of Lebanon, a Polished MB IIA jug and juglet from Tell Ibn Hani along the north Syrian coast, and a Polished MB IIA-B dipper juglet from Megiddo in the Jezreel Valley--are definite Levantine imports from regions outside of Southern Palestine. Other possible NAA "matches" of MB IIA Canaanite Jars from the southern Lebanese coast (Ruweisé near Sidon), the inland Biqa`a Valley of Lebanon (Kamid el-Loz), and the middle and upper Orontes River valley (Tell Mardikh/Ebla and Tell `As) suggest some involvement with these regions early in the MBA. Contacts between Avaris and Ebla are also implied by the finding of artifacts inscribed with the name of the early 13th Dynasty ruler, Hetep-ib-Re` Amu-sa-Hornedjheryotef, at both sites: a statue from Tell el-Dab`a (Habachi 1954) and a scepter from Tell Mardikh (Matthiae 1980b and Scandone Matthiae 1979 and 1982) together with ivory box-inlays with Egyptian motifs (also see Bietak 1996 and contrast Ryholt 1997: 84-85, 214, nn. 265 and 737). During MB IIA and IIA-B, Kamares ware, probably originating from Crete, was also imported. Contacts with Cyprus represented in the corpus are limited to two later MB Miscellaneous vessels--an MB IIC pithos and MB IIB-C sherds with finger impressions.

An absence of meaningful matches for the Tell el-Dab`a pottery to sites in other regions may also be significant. Thus, all of Transjordan, the Hill Country of Palestine, Anatolia, and northern and southern Mesopotamia yielded no NAA matches. To some extent, this negative evidence is not compelling, because clays and pottery from sites in a region (in particular, Anatolia and Mesopotamia) have been inadequately sampled. However, the lack of even possible "matches" for Transjordan and the uplands of Palestine, which are very well represented in the database, indicates that these regions did not produce very much pottery, if any, that reached Tell el-Dab`a.

It is noteworthy that no NAA matches were recorded for two major MB coastal sites, Byblos and Ras Shamra/Ugarit, although Tell Ibn Hani, from where imports did originate, served as the port city for the latter. Since Byblos has been proposed as a prime source of imported pottery at Tell el-Dab`a and even a "homeland" of sorts for the site's burgeoning population (below), this finding is problematic. Again, limited sampling for Byblos is very possibly a contributing factor. The discovery of a clay in its vicinity, which might be comparable to the red loess clay of Southern Palestine, is a less likely explanation. A gradual increase in transition metals (particularly Cr, Mn, and Co), alkalis and alkaline earths, and, to a more limited extent, in the rare earths are observed in the clays and the local compositional groups going from south to north along the Mediterranean coast (Chapter 1). This trend is even more pronounced than it might otherwise seem, since the pottery from northern sites

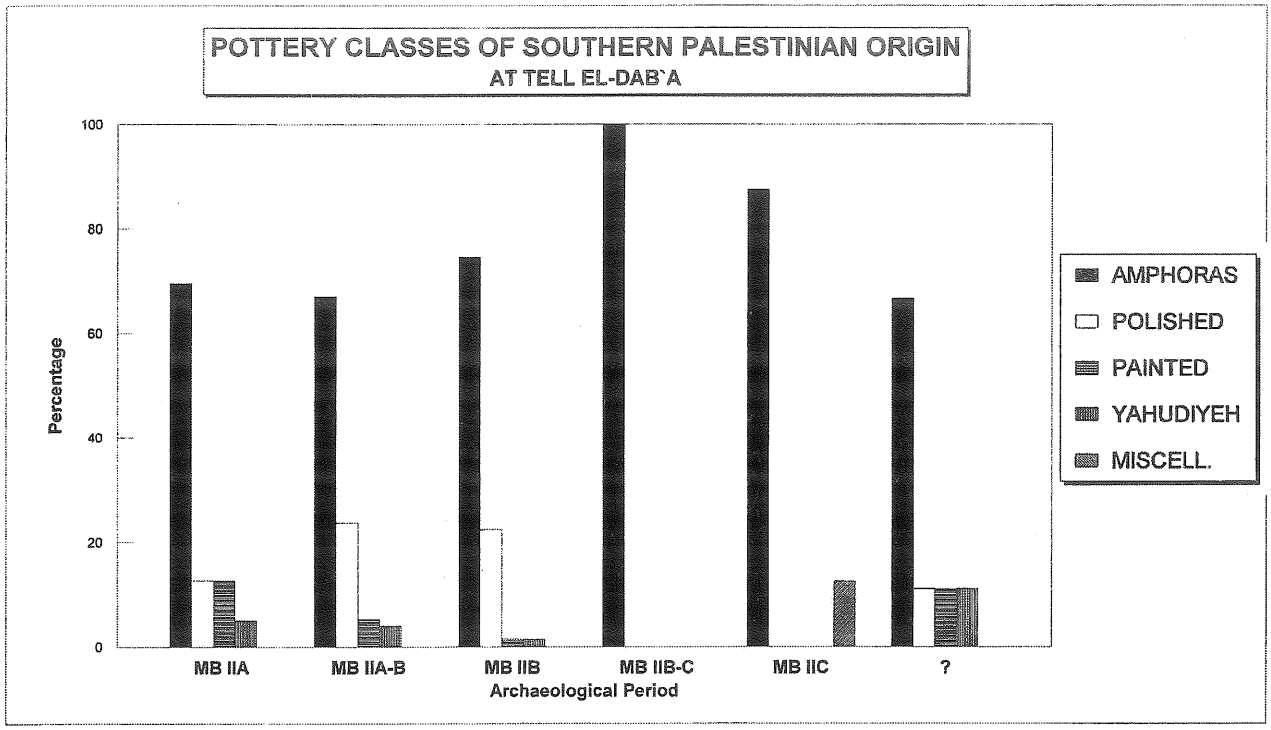

Fig. 26: Relative percentage of major pottery classes originating from Southern Palestine (i.e., made of red loess clay), for each sub-period of the Middle Bronze Age. Samples of uncertain type (?) are also shown.

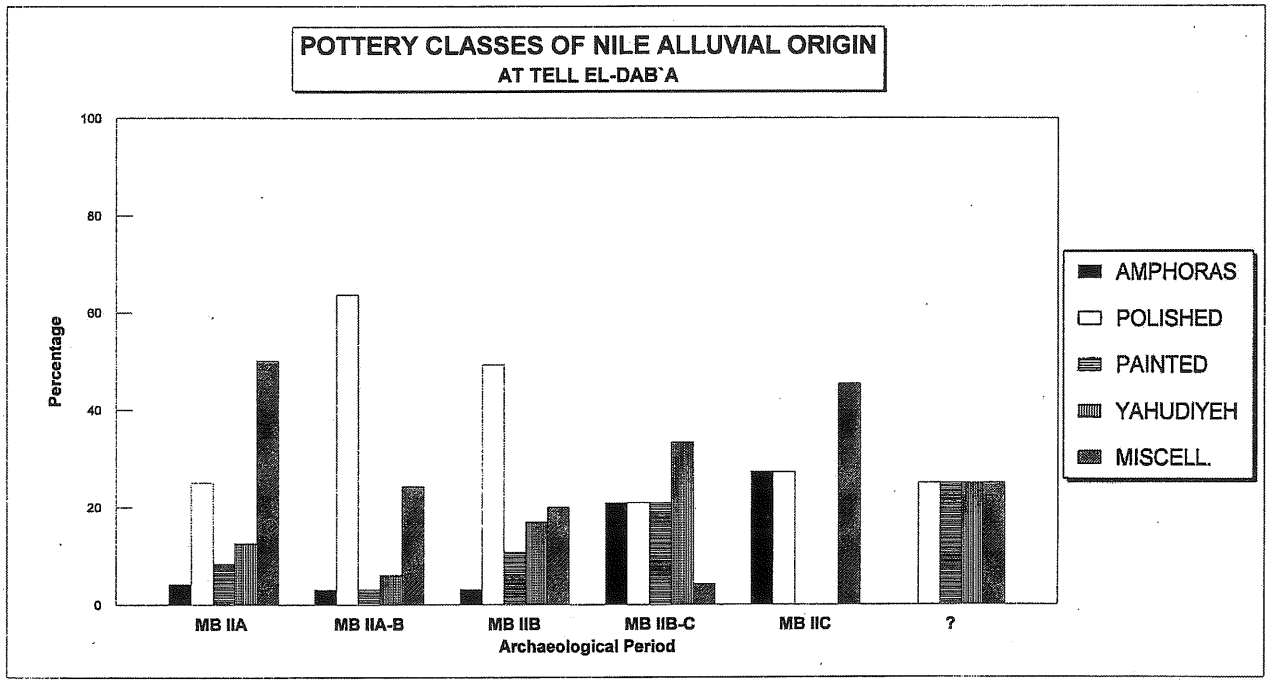

Fig. 27: Relative percentage of major pottery classes originating from Tell el-Dab`a (i.e., made of Nile alluvial clay), for each sub-period of the Middle Bronze Age. Samples of uncertain type (?) are also shown.

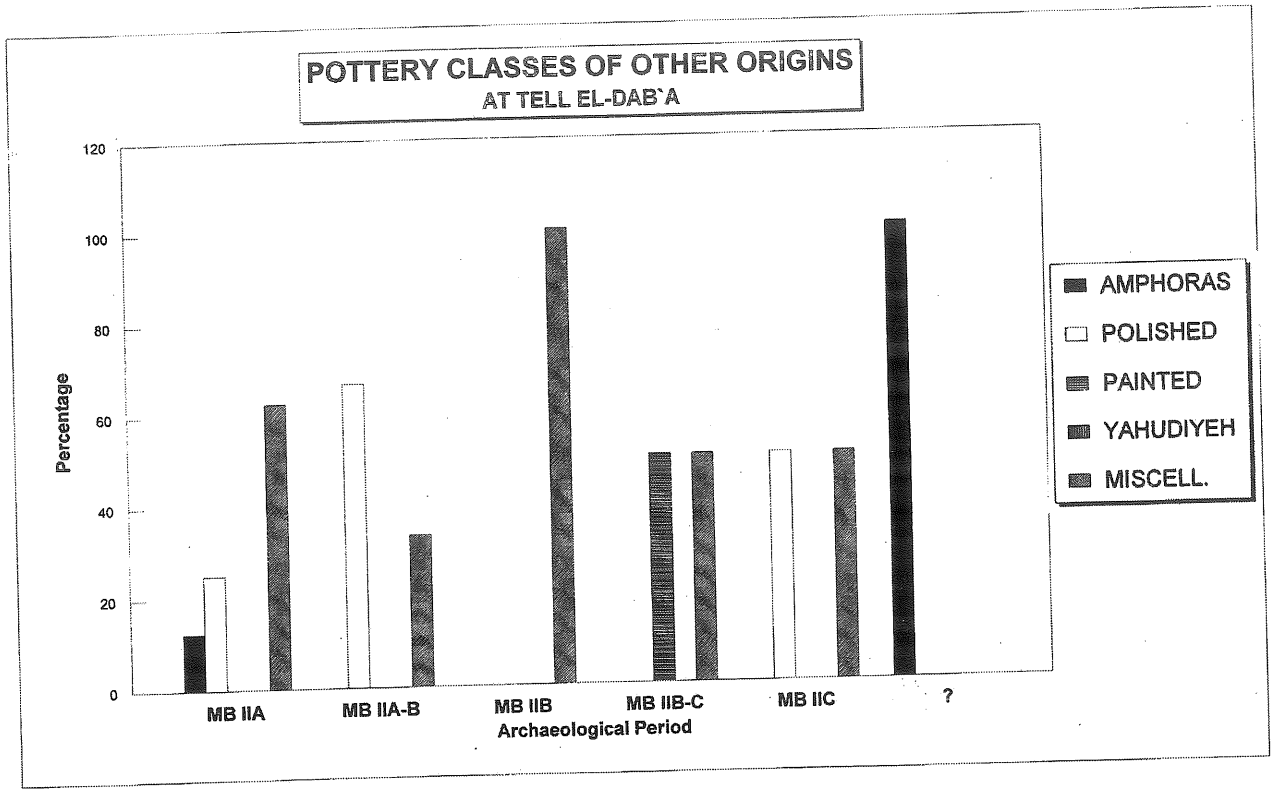

Fig. 28: Relative percentage of major pottery classes originating from other regions of Egypt (e.g., Middle Egypt), regions outside of Southern Palestine in the Levant, Cyprus, and the Aegean, for each sub-period of the Middle Bronze Age. Samples of uncertain type (?) are also shown.

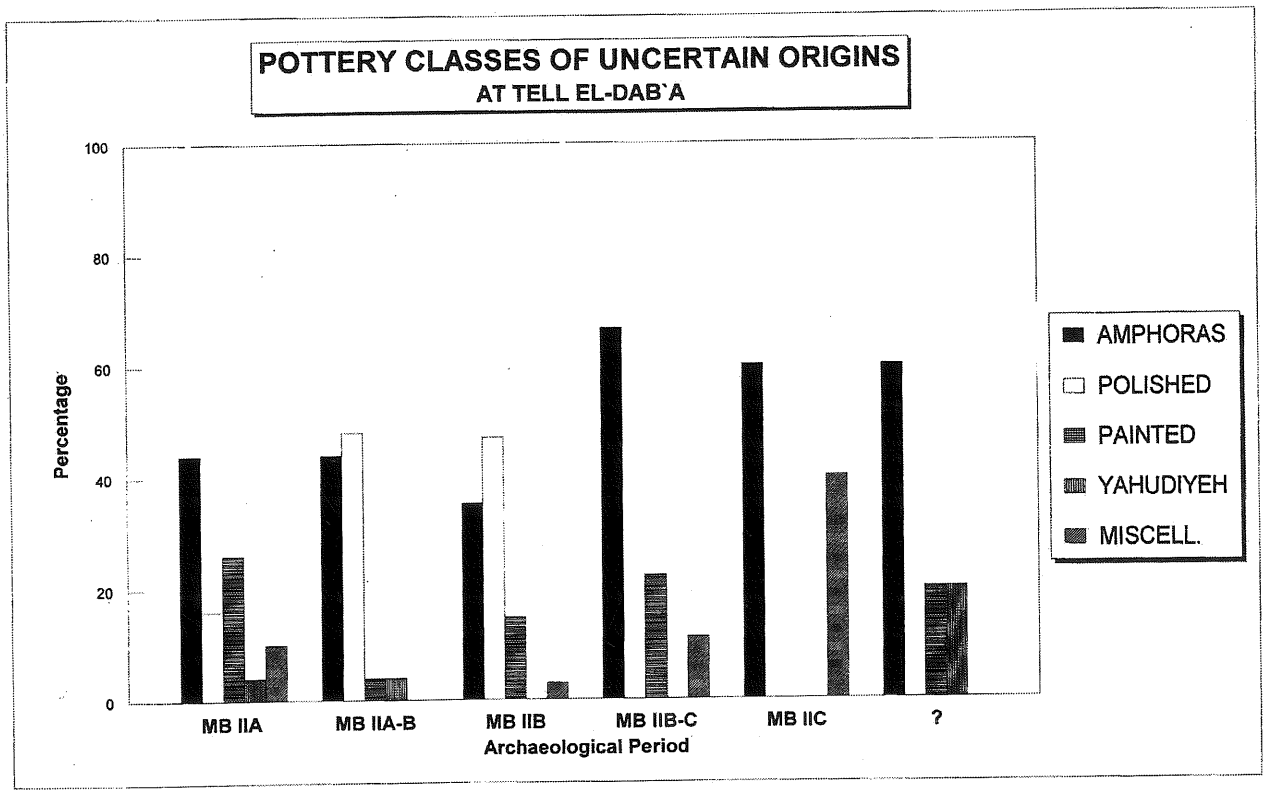

Fig. 29: Relative percentage of major pottery classes of uncertain provenience, for each sub-period of the Middle Bronze Age. Samples of uncertain type (?) are also shown.

were tempered more heavily with calcite, which has a diluent effect on chemical composition.

The lack of imports coming from the central Palestinian Coastal Plain, including Jaffa and sites in the Plain of Sharon (Tel Aphek and Tel Ifshar), may help to explain absences elsewhere along the coast. Like Tell el-Dab`a, the mid-coastal region received imports (primarily, Canaanite Jars, carinated bowls, and juglets) from Southern Palestine, rather than exporting pottery elsewhere. Imports from Southern Palestine were also documented along the southern Lebanese coast and in central inland Syria, although to a lesser extent than at sites in the central Coastal Plain. From this evidence, a case can be made that certain goods--whether the pottery for its own sake or the contents of the pottery vessels--were being exported from Southern Palestine (below). It is not clear what was being exchanged for these goods, since very little if any pottery appears to have been transported in the reverse direction from these regions to Southern Palestine. The crucial point remains that Southern Palestine was generally the origin of the Syro-Palestine types of pottery which dominate the NAA corpus at Tell el-Dab`a. Sites that were north of Southern Palestine along the coast, including Byblos, simply did not export very much pottery to Tell el-Dab`a and Southern Palestine. Tell Ibn Hani, as the port city of Ras Shamra/Ugarit, may represent a special case of a more dynamic economy; goods, most likely the contents of Canaanite Jars and Polished jugs and juglets that had been locally manufactured, did flow from this site southwards.

Pottery which is of uncertain provenience (Fig. 29) poses its own set of problems. For example, one might argue that relatively more Canaanite Jars from early MB IIA levels at Tell el-Dab`a are of uncertain provenience (Chapter 1), because they derive from sites or regions of Lebanon and Syria that are not well represented in the NAA data bank. However, a follow-up NAA study of MB IIA Canaanite Jars, which were specifically selected because they were believed to be possible imports from the northern Levant, showed that the relative percentage of samples with problematic origins did not exceed the average. As has been stressed throughout this study, there will always be some samples of questionable origin as a result of statistical variances in clay beds, ancient clay preparation, and the experimental error of the NAA technique itself. Especially stringent statistical criteria also meant that many samples could not be definitely assigned to a specific local group. With these provisos and given the absolute numbers of vessels for each type (Table 4), no single Syro-Palestinian pottery class stands out as having relatively more specimens of uncertain origin.

2. Trade Relations with Southern Palestine

The NAA results provide direct evidence for trade, which appears to have been particularly intensive in a unidirectional fashion from southern Palestine to the northeastern Nile Delta. Although one Tell el-Yahudiyeh juglet made of Nile alluvial clay has been confirmed for the "Gaza group of Middle Bronze Age sites" in Southern Palestine (viz., at Ashkelon, see Chapter 2; also one example at Yavneh Yam *apud* Kaplan 1980: table 4, and as confirmed by rerunning this sample against the enlarged database here), none of the other classes of vessels are as yet attested in an Egyptian clay from any of these sites.

The imports from Southern Palestine found at Tell el-Dab`a are chemically closest to the local groups at Tell el-`Ajjul and Ashkelon. Both of these are coastal sites, which had natural harbors for mooring and handling ships. Tell el-`Ajjul, which has been identified with the Hyksos bastion Sharuhen (Kempenski 1974), is one of the few sites in this region that has yielded MB IIA material (the Courtyard Cemetery). When the NAA results for the Tell el-Dab`a first revealed the strong Southern Palestinian connection, the lack of other MB IIA deposits at sites in the Gaza region was difficult to explain. The discovery of an MB IIA mudbrick arched gateway, part of a glacis fortification system that extended some 2 km and possibly enclosed an area as large as 150 ha, at Ashkelon in 1992 (Stager 1993) came as a remarkable confirmation of the NAA finding. Although the site has been encroached upon by the sea and partly destroyed, it is clear that Ashkelon was one of the largest cities in Syria and Palestine at that time. If it were possible to excavate more of ancient Gaza or Jaffa, both of which are covered by modern cities, further evidence of an MB IIA city-state system in this region would probably emerge. Even at sites already extensively excavated (e.g., Tell el-Far`ah South), MB IIA levels might not have been reached and still remain to be uncovered. The prominence of Sharuhen in the Egyptian textual evidence, which took Ahmose some three years to besiege and capture, suggests that one of the larger sites in the region, such as Ashkelon, is a better candidate for its identification, rather than Tell el-Ajjul, which covered an area of only 12 ha.

Significantly, all of the Canaanite Jars with seal/scarab impressions on their handles in the NAA corpus came from Southern Palestine. Other investigators (Weinstein 1981 and 1991; Ryholt 1997) have stressed the prevalence of with pseudohieroglyphs and other typical Hyksos-style motifs at sites in the Gaza region, especially Tell el-`Ajjul. One seal impression on a Canaanite Jar from Southern Palestine (JH091) is unusual in having a legible hieroglyphic inscription that reads "ruler [of] *shimu*." The word for "ruler" or "governor" (Eg. *ḥ3ty-* `) is the same title as that used by the Byblian princes of the 12th and early 13th Dynasties (Lorton 1974: 64; Ward 1961: 134-35) and as that which appears on an inscribed stone bowl from the Late Bronze Age palace at Kamid el-Loz (ancient Kumidi) in the Biqa`a Valley of Lebanon (Edel 1983). The name, *shimu*, may refer either to the prince or the region that he ruled over (see Bietak 1994: 22 and 1996: 60). If the latter, the NAA results imply that *shimu* refers to the Gaza region itself and/or one of its major cities. The "ruler [of] *shimu*" seal was impressed into the Canaanite Jar during MB IIB-C, at the height of Hyksos power at Tell el-Dab`a. Paralleling this phraseology and further

reflecting the close ties between the northeastern Delta and the Gaza region, the king of Avaris is called "the ruler of Retenu [Syria-Palestine]" in the second Kamose stela (Habachi 1972).

The concentration of MB IIA sites along the Southern Palestinian littoral points up another important aspect of their trade relations with the northeastern Delta. Most of this trade was probably carried out by ship, rather than by transporting pottery and other goods overland by donkey through the Sinai. Based on extensive surveys along what later was called the "Ways of Horus," Oren (personal communication) has shown that a regularly spaced chain of way-stations for the ten or more day trip across the desert did not exist in the MBA. Only small encampments, presumably of transhumants, were found, with distinctive local pottery types and small quantities of imported pottery from Egypt and Palestine.

Ship transport, especially for heavy loads, would have been an excellent alternative to overland trade. The harbor at Tell el-Dab`a, although long since silted up, was reached via the Pelusiac branch of the Nile. Based on a systematic program of subterranean drilling, an intricate system of waterways has been defined around the site and a harbor area has been located where ships could have been moored. Corroborating this finding, the contemporaneous Kamose stelae mention ships docked together in the harbor of Avaris (see Redford 1997).

The best way to appreciate the scale of this sea trade is to make an approximate calculation of the number of Canaanite Jars arriving at Tell el-Dab`a's port during the course of the MBA. Based on the number of Canaanite Jars that have already been excavated at Tell el-Dab`a, it has been estimated that as many as two million Canaanite Jars might eventually be recovered from the MB levels of the site, if fully excavate (Bietak 1996: 20). If it is conservatively estimated that three-quarters of these vessels were imported from Southern Palestine, then about 6000 jars per year or almost 20 jars per day were imported over the 250 years of the lifetime of the city.

Is it conceivable that so many amphoras could have been imported? The importation of one and half million Canaanite jars by sea over several hundred years is certainly possible, even if shipping had to be confined to those times of the year when the weather and prevailing winds and currents were favorable. Cargoes might vary, but shipment by Canaanite Jars had the added advantage that they could be used as ballast in the holds of ships (compare the Uluburun merchantship, which included tin and copper ingots--Pulak 1988 and Bass, et al. 1989; also see Pl. 16).

3. The Contents of the Canaanite Jars from Southern Palestine

The relative percentages of imported and locally made Canaanite Jars in each MB sub-period presents a contrasting picture to that of the other classes of Syro-Palestinian pottery: while imported Polished, Painted, Tell el-Yahudiyeh, and other distinctive pottery types drop off in MB IIA-B/MB IIB, to be overtaken and exceeded by virtually identical products in Nile alluvial clay, Canaanite Jars continue to be imported from Southern Palestine in approximately the same numbers throughout the MBA. Canaanite Jars made of Nile alluvial clay are already present in MB IIA, and they do come to constitute as much as a quarter of the MB IIC corpus, but local production is very much overshadowed by the imports. How is this to be explained? It might be proposed that Nile alluvial clay was less well suited to making dense, impermeable fabrics, such as are required for shipping liquid goods. Yet, large Egyptian-style jars were made of Nile alluvial clay and were no doubt used to transport goods. Moreover, by the New Kingdom, locally made Canaanite Jars were a standard part of the Egyptian pottery repertoire (Wood 1987), serving as storage containers for common foodstuffs, such as meats, fats, honey, "ale," *ben*-oil, and even water (McGovern 1997a). Frescos and reliefs of this period make it clear that Canaanite Jars were still being imported, and very likely carried wine, olive oil, tree resins, incense, and other goods, especially those that might not be available in Egypt (Leonard 1995). The second Kamose stela (Habachi 1972) implies that some of the same goods (viz., fats, honey, and *ben*-oil) were already being imported into Tell el-Dab`a/Avaris during the Second Intermediate Period.

Another scenario can be proposed to account for the unusual pattern of imported and locally made Canaanite Jars at Tell el-Dab`a during the MBA. These imported Canaanite Jars might have carried a more limited range of highly specific, valuable commodities that would have been the case in the New Kingdom. Considering their primary origin in Southern Palestine, viz., the Gaza group of Middle Bronze Age sites, wine might well have been the commodity of choice. Canaan, especially the Gaza region, was famous for its wine (Broshi 1984; Stager 1985), so it is not unreasonable to propose that the "Hyksos" of Tell el-Dab`a, who were in close contact with Southern Palestine according to the NAA results, imported wine in Canaanite Jars from this region throughout the MBA.

Wine had been produced in the Nile Delta from as early as the 3rd Dynasty and probably even before then, during Early Dynastic times, once the domesticated Eurasian grapevine (*Vitis vinifera* L. subsp. *vinifera*) had been transplanted and a royal industry established there (McGovern et al. 1997; James 1995). The greater economic uncertainties of the late Middle Kingdom and the Hyksos period, however, might have curtailed wine

production in the Delta, and encouraged its importation from Southern Palestine by the Hyksos and their predecessors at Tell el-Dab`a. The sheer demand for more wine, as the population of the site grew, would further contribute to its importation.

If there were a recession in the native winemaking industry during the MBA, it had been reversed by the New Kingdom. Contacts with Levantine winemakers, perhaps mediated through the Hyksos at Tell el-Dab`a, appear to have been crucial in the expansion of the industry. New Kingdom texts, including the second Kamose stela, highlight the prevalence of Levantine tradition in Egyptian winemaking (Lesko 1995). Perhaps significantly, the only winemaking installation in ancient Egypt which predates Hellenistic times has been excavated at Tell el-Dab`a (Bietak 1985). Dating to the reign of Horemhab of the late 18th Dynasty, a small plastered stone vat in a corner of an enclosed courtyard of a temple to the god Seth (or Sutekh, according to the Asiatic pronunciation introduced by the Hyksos--see Bietak 1990a) was found in association with a garden in which the small size of the pits and their wide spacing argues for a vineyard having been planted there. The treading of grapes in ancient Egypt was often done in small plastered installations (Pl. 17), with the grape must or juice being directed into a side vat. The trough for the run-off of the must for the Dab`a installation was bifurcated, so that juice could have been directed into two vats simultaneously or sequentially. The god Sutekh/Seth was the patron god of both the "Hyksos" and the later pharoahs of the 19th and 20th Dynasties, and was assimilated with the Asiatic storm god, Ba`al, during the New Kingdom (Bietak 1990a).

In order to test the "wine hypothesis" for Tell el-Dab`a, selected Canaanite Jars and an Egyptian-style jar, some with visible deposits on their interiors and others lacking any residue, were subjected to the battery of organic chemical analyses in the Archaeochemistry Laboratory of the University of Pennsylvania Museum's Applied Science Center (MASCA). These analyses, including Fourier-transform infrared spectrometry (FTIR), high-performance liquid chromatography (HPLC) and spot tests, have been specifically designed to detect ancient fermented beverages, especially wine and beer (McGovern, et al. 1996 and 1997; McGovern 1997a). The jars dated to various sub-periods of the MBA and were from burial and residential contexts. Positive results for wine were obtained, as follows:

1) JH020: Canaanite Jar, MB IIB, burial context, import from Southern Palestine.

2) JH082: Canaanite Jar, MB IIB-C, reused for infant burial, locally made of Nile alluvial clay.

3) JH608: Canaanite Jar, MB IIA, residential context, import from Southern Palestine.

4) pottery no. 7373G: dark red residue inside Canaanite Jar, MB IIB-C, area FI, square q/24, pl. 1, probable residential context, macroscopic fabric assignment suggests Levantine origin, although no NAA was carried out.

5) pottery no. 7648M: whitish accretion, with dark-colored organic growths, inside Canaanite Jar, no dating, area AIV, square j/6, pl. 1-2, context uncertain but possibly burial, macroscopic fabric assignment suggests Levantine origin although no NAA carried out.

6) no field or pottery no.: plaster, with reddish areas on surface, from probable grape-treading installation in Sutekh/Seth temple enclosure.

The following samples gave negative results for wine, as well as any other ancient organic material:

7) JH011: Canaanite Jar, MB IIB, residential context, import from Southern Palestine.

8) JH015: Canaanite Jar, MB IIB, reused for infant burial, import from Southern Palestine.

9) JH040: Canaanite Jar, MB IIA, burial context, locally made of Nile alluvial clay.

10) JH063: Egyptian-style jar, MB IIB, residential context, locally made of Nile alluvial clay.

11) JH693: Canaanite Jar, MB IIA, residential context, import from Southern Palestine.

12) JH697: Canaanite Jar, MB IIA, palace context, import from Southern Palestine.

13) field no. K4368: MB IIC-LB IA, whitish material inside Canaanite Jar, citadel garden at `Ezbet Helmi, uncertain fabric type, no NAA carried out.

14) field no. K6102: uncertain date, whitish accretion inside Canaanite Jar, citadel at `Ezbet Helmi, macroscopic fabric assignment suggests Levantine origin although no NAA carried out.

The preservation of organic remains was poor at Tell el-Dab`a, because of the humid climate and high water table. Irregularly shaped, dark-colored blotches, probably due to molds or fungi, occur on the inside and outside of many of the Canaanite Jars. Since these discolorations sometimes are found on the cross-sections of sherds, they are definitely post-depositional. When a residue covers a more extensive interior surface of the jar, especially the lower half or base, it is more likely to represent the contents of the last usage of the vessel. Only one of the samples that was analyzed had such a residue, viz., no. 4 above, with a dark reddish deposit, about 0.1 mm (100 μ) in thickness, which is easily flaked off from the underlying fabric. The surface of the small piece of plaster (ca. 1 cm^2) from the probable grape-treading installation (no. 6) also has similarly colored patches. Reddish deposits are suggestive of grape or wine residues; this coloration,

probably due to polyphenolic pigments in grape, is very often observed on the inside of ancient wine jars (McGovern, et al. 1997). Three samples (nos. 5, 13, and 14) had a whitish accretion on their interiors. Except nos. 13 and 14, which were analyzed as the unextracted solids, whole sherds, with dimensions of 3 cm or more, were generally extracted with two treatments of boiling methanol for 20 min. Any organics which were trapped within the pores of the fabric or otherwise bound up in the clay of the pottery were thus extracted, even if no residue was visible on the surface.

The battery of chemical analyses that were carried out clearly showed the presence of tartaric acid and/or calcium tartrate in five out of twelve Canaanite Jars, as well as the plaster surface of the probable grape-pressing installation in the Sutekh/Seth temple. The FTIR and HPLC spectra and chromatograms for these samples are very similar to those obtained from other wine jars throughout the Middle East, dating from Neolithic times to the Byzantine period (see, especially, McGovern and Michel 1995, McGovern, et al. 1996, and McGovern, et al. 1997).

Tartaric acid occurs in large amounts in nature only in grapes, and its insoluble calcium salt formed in the calcareous environment of the site. Only one jar (no. 4) provided unequivocal evidence that it had once been filled with a liquid--a residue that covered its bottom half where precipitates settle out--but, judging by its long, narrow neck and rounded base by which the outward pressure of a liquid would be equilibrated, the Canaanite Jar was best well suited and probably developed in the early MB IIA Levant for transporting and storing liquids. Assuming that the other four positives for tartaric acid/calcium tartrate represent grape juice, then under normal conditions and at room temperature, this liquid would have quickly fermented to wine. Indeed, because of slow pressing methods in antiquity and high temperatures in the Middle East, fermentation had probably already begun before the liquid went into the jar. Although not found in place on the jars, clay stoppers of approximately the same diameter as that of the jar mouths have been recovered at Tell el-Dab`a, so that the Canaanite Jars could have been sealed, thereby preventing the wine from turning to vinegar.

Five chemically confirmed wine jars are too few samples to draw any far-reaching conclusions, but they are in accord with the "wine hypothesis." Two wine jars (nos. 1 and 3), dating to MB IIA and IIB, are imports from Southern Palestine. Another jar (no. 4), dating to MB IIB-C, probably originated in Southern Palestine. Importation of wine to Tell el-Dab`a from Southern Palestine is thus confirmed for almost the entire MBA. One wine jar (no. 2), however, was made of Nile alluvial clay, and dated to MB IIB-C, implying that a local winemaking industry was in operation by at least this time. This finding was corroborated by the positive result for the plaster covering the probable grape-treading installation dating to the early New Kingdom at the site. The Levantine origins and continued expansion of the Delta industry during the New Kingdom is reflected in the name of the famous 19th Dynasty vineyard of Kaenkeme (Eg., "vineyard of Egypt"), located at the capital of Pi-Ramesses which is to be equated with modern Qantir, only several kilometers north of Tell el-Dab`a. The root of this name, which is first used in the Kamose stelae, is probably of Levantine derivation (Bietak 1985) and provided the later Egyptian words for "vineyard" (*k3mw*) and "vintner" (*k3my*).

The wine of Kaenkeme is described as being "mellow...surpassing honey" in Papyrus Anastasi III, 2, 6 (Caminos 1954: 74). With such fine wine at their doorsteps, New Kingdom Delta towns and cities hardly had any need to import wine from abroad. Indeed, a century following the Amarna Age, the wine ostraca from the Ramesseum, the mortuary temple of Ramesses III (1184-1153 B.C.) in western Thebes, mention some thirty estates which were situated in a very regular fashion across the whole of the Delta. According to the Great Papyrus Harris (I, 7, 10 ff), Ramesses III planted vineyards throughout the Delta, as well as in the oases and to the south of Egypt, using vintners and laborers that he had captured in foreign expeditions. In the same papyrus (I, 15a, 13 and 18a, 11), the king claims to have presented 59,588 jars of wine to his god, Amun. During the Amarna Age itself, most of the wine appears to have been produced in the northwestern Nile Delta, the so-called "Western River" of the Malkata and el-Amarna ostraca and of Canaanite Jar inscriptions in the tomb of Tutankhamun (McGovern 1997a). These vineyards and winery estates were situated along the Canopic branch of the Nile, which enters the Mediterranean at modern Alexandria; Byzantine winemaking installations have been excavated in this region at Marea, about 45 km south of Alexandria (el-Fakharani 1983; Empereur 1993).

The lack of evidence for wine for the other eight samples, including an Egyptian-style jar, does not prove that they never contained wine. Preservation conditions for these samples were evidently even poorer than for the jars and the plaster installation that tested positive for wine, since possible remnants of tartaric acid, calcium tartrate, and terebinth tree resin (see below) were detected in several of the HPLC analyses. Still, it may be significant that a locally made Canaanite Jar (no. 9) of Nile alluvial clay, dating to MB IIA, tested negative, fitting with the "wine hypothesis" that any local production of wine was minor compared to its importation from Southern Palestine. The whitish material and accretion inside nos. 13 and 14 were post-depositional calcium carbonate deposits, according to the infrared analyses.

The HPLC results pointed to another component that made it virtually certain that the five Canaanite Jars originally contained wine. The ultraviolet absorption spectrum of the unknown component closely matched that of terebinth tree resin, which is also known as Chian turpentine. It has been described as the "queen of resins" (Majno 1975: 210). The terebinth tree (*Pistacia atlantica* Desf.) has been and is widespread and abundant in the Middle East, occurring even in desert areas of Egypt, and a single tree, which can grow to as much as 12 m in height and 2 m in diameter,

can yield up to 2 kg of the resin in late summer or fall. In recent times, it has been used to make chewing gum in Greece and to prepare perfume in the eastern desert of Egypt. Its "turpentine" odor and taste, which was not as concentrated in the resin as in the distillate commonly known by this name today, was evidently not considered to be offensive.

The earliest wine that thus far been confirmed chemically by the MASCA laboratory is from the Neolithic village of Hajji Firuz Tepe, located in the Zagros Mountains of northwestern Iran, and terebinth tree resin had also been added to it (McGovern et al. 1996). Mixing wine and terebinth tree resin continued to expand in later periods throughout the ancient Near East and Egypt, and their pharmacopias were dominated by these ingredients during literate times (Majno 1975). The resin was widely traded in some periods. The Uluburun "royal" shipwreck found off the southern coast of Turkey, for example, carried numerous amphoras partly filled with terebinth tree resin, attesting to the resin's importance during New Kingdom. Preliminary chemical tests carried out in the MASCA laboratory also suggest that some of the Uluburun jars were filled with a resinated wine (McGovern 1997a).

The medicinal benefits, as well as the pleasurable effects, of resinated wine, particularly with terebinth tree resin as the additive, are highlighted in the writings of much later periods. For example, Pliny the Elder, the famous 1st century ad Roman encyclopedist, describes the *grand crus* of his day. Going beyond their medical value, he also provides the rationale for why tree resins were added to wine in antiquity. A large part of book 14 of Pliny's *Historia naturalis* is devoted to the problem of preventing wine turning to vinegar, and terebinth tree resin, the "best and most elegant" resin, was added to Roman wines for just this purpose. The pragmatic observation of the ancients that tree resins can control "wine disease" (in which acetic acid and lactic bacteria turn wine to vinegar), as well as human disease, is borne out by modern chemical research. Terebinth tree resin, in particular, contains a group of compounds, the triterpenoids, which act as anti-oxidants, impeding the growth of bacteria. Other resins--for example, from pine and cedar trees, and frankincense and myrrh--have related chemical compounds, and were also employed in ancient medicine and wine preservation. The myrrh tree (genus *Commiphora* of the Burseraceae family) was already known and used as an additive in wine in New Kingdom Egypt (McGovern 1997a); it became the premier Roman wine additive, although it had to be imported from the southern Arabian peninsula. The only modern carry-over of the ancient tradition of preserving wine with tree resins is Greek *retsina*, to which pine or the north African sandarac tree resin is added. The resinated wine imported from Southern Palestine to Tell el-Dab`a and later produced there in quantity thus stands within a long Middle Eastern tradition.

4. Other Important Vessel Types Imported from Southern Palestine

Although their contents are yet to be determined, other vessels types in the Polished, Painted, and Miscellaneous classes are of interest, because they originated from Southern Palestine and played a role in the intense trade with the eastern Nile Delta as exemplified by the Canaanite Jars.

In the Polished class, miniature juglets, with rare exception, came from the "Gaza group of Middle Bronze Age sites." Many of the juglets and jugs proper, whether dipper-shaped, piriform, globular or bulbous in shape and whether having an interior gutter, stepped or simple rounded rim, also were made in Southern Palestine, until these began to give way increasingly from MB IIA-B onwards to vessels made of local Nile alluvial clay. Even the MB IIA and IIA-B Polished jugs with cut-away spouts, which have often been seen as inspired by northern Levantine and Anatolian developments, derive exclusively from Southern Palestine. The available evidence suggests that the MB IIA "amphora jugs" and an unusual piriform jar (JH304), dated to MB IIB, are generally Southern Palestinian products. An elaborately incised bowl (JH896) must have been a speciality item from this region. Other features that are documented only on Polished vessels imported from Southern Palestine include the following: handle attachment to a mid-neck ridge, incised horizontal lines at the base of the neck, and the tripartite, "snake" handle (sometimes with applied knobs at the base of the handle).

Given the prominent northern distribution of Levantine Painted Ware, belonging to the first half of the MBA, the importation of the same stylistic types from Southern Palestine cannot be overemphasized. Most of the characteristic shapes and features of MB IIA-IIA-B Levantine Painted Ware--bichrome concentric circles on handleless jars, various monochrome and bichrome geometric designs on jugs or jars, etc.--are definitely or possibly represented in the Southern Palestinian NAA repertoire. Although it can be argued that some samples of uncertain origin might derive from another Levantine region, which is poorly represented in the database, a more likely explanation is that these samples remain unassigned due to statistical variability in clay beds, potting traditions, and/or the analytical technique itself.

Painted wares had regained their popularity at Tell el-Dab`a by MB IIC, but exports from Palestine are non-existent in the NAA corpus. Even two Bichrome Ware examples are made of Nile alluvial clay.

Only one vessel type of the Miscellaneous class was imported from Southern Palestine: an MB IIC "keeled" deep bowl (JH292). MB IIA prototypes, dating more than two hundred years earlier, are best known from central inland Syria, although the type is also attested at well-excavated and dated sites from mid-coastal Palestine (e.g., Tel Aphek).

5. Trade Relations with Other Levantine Sites and Regions

The very limited trade with regions of the Levant and the Near East generally, outside of Southern Palestine, is also restricted in time to MB IIA and IIA-B. If the possible chemical "matches" are included, this group is comprised of ten vessels (1.7% of the NAA corpus).

Tell Ibn Hani, the port city of Ras Shamra/Ugarit, is most prominent, accounting for four vessels: an MB IIB Canaanite Jar and three MB IIA-B Polished jugs and juglets, including a miniature. The site's location along the north Syrian coast is in keeping with the interpretation that the imported pottery found at Tell el-Dab`a was primarily the result of sea trade (above). Although no definitive chemical analyses have yet established the contents of these vessels, Polished jugs and juglets were most likely containers for specialized liquid products, such as perfumed oils.

Coastal and inland Lebanon and inland Syria are represented exclusively by Canaanite Jars: four MB IIA examples and one IIA-B example. Three of the MB IIA amphoras--coming from Tell `Arqa along the northern coast of Lebanon, and from Kamid el-Loz and Tell Mardikh/Ebla in inland regions--were recovered from the same refuse pit, which was associated with the palace in area FI.

It is noteworthy that only the earliest MB phases at Tell el-Dab`a have yielded imports from regions outside of Southern Palestine. Once the site was well established and had begun to increase in population in later MB IIB, pottery was imported only from Southern Palestine. Tell el-Dab`a was probably occupied somewhat later in MB IIA than sites along the Levantine coast, as evidenced by the lack of characteristic early MB IIA pottery types (e.g., the non-ridged, exteriorly folded and triangulated rim variety of the Canaanite Jar) and the presence of later types (such as Polished jugs and juglets) at the beginning of the Dab`a MBA sequence. The more active and widespread trade network of MB IIA and IIA-B, which was contemporaneous with the growth of city-states throughout Syria-Palestine, eventually gave way to more defined, and presumably more regulated, exchange with only Southern Palestine from MB IIB onwards.

6. Intra-Egyptian Trade Relations

A perhaps surprising result of this NAA study is that trade relations between Tell el-Dab`a and Middle Egypt (specifically, the Fayyum-Memphis region) were more intense than they were with other regions of the Levant and Near East outside of Southern Palestine. Twelve vessels (2% of the NAA corpus) at Tell el-Dab`a--two Polished juglets, six jars ("water storage jars" or *zirs*) and four body sherds which probably belong to the latter jar type--were made of the Upper Eocene marl clay that outcrops in the Fayyum-Maadi region, and date to various sub-periods of the MBA. It has not yet been determined what the juglets and *zirs* contained, but it is unlikely to have been merely water.

Trade in the reverse direction is attested by the numerous Canaanite Jars and Tell el-Yahudiyeh juglets made of Levantine fabrics that constitute 3.4% of the pottery assemblage of Dynasty 13 houses at Lisht or *jt-t3wj*, the capital of the native Egyptian 13th dynasty (Do. Arnold, et al. 1995). This percentage even exceeds that for Dynasty 12 (<1%). In addition, two Tell el-Yahudiyeh juglets from Kahun (JH180 and JH181 in Appendix 2; NAA data not published here), a small Middle Kingdom town in the Fayyum (see Chapter 1), were made of Nile alluvial clay, most likely produced in the Tell el-Dab`a region because of their close chemical comparability to the large local group there.

The development of Tell el-Dab`a in the northeastern Nile Delta would then appear to have stimulated trade within Egypt, rather than having led to a breakdown of political unity and consequent economic disruption, as stressed or implied by most historical reconstructions of the period. As the main entrepôt for goods both produced in the eastern Delta and coming into Egypt from abroad, such goods could have been transferred to pottery vessels made of Nile alluvial clay or simply transshipped up the Nile in their original containers to the Memphis and Lisht areas.

Some indication of what was being imported from the Levantine coast to Middle Egypt is provided by the preliminary organic analysis of a Canaanite Jar (JH144; see Appendix 2 and Chapter 1) from a late 12th-early 13th Dynasty context (Complex 6) in the Amenemhet III pyramid precinct at Dahshur (Do. Arnold 1982). The base of the vessel's interior was covered with a dark reddish residue, which proved to be primarily resinated wine according to the MASCA laboratory's battery of chemical tests (above). Other goods, such as pine resin and olive oil, which were important in the mummification process and daily offerings at the pyramid complex and could not be produced in Egypt, must also have been imported.

Direct interactions between the Middle Kingdom, at the height of its power during Dynasty 12, and the Levant is evident from the new pottery styles and technologies that were introduced by the time of the second king of Dynasty 12, Senwosret I (high 1959-1914 B.C. (Do. Arnold 1993). In the middle of Dynasty 13, local marl clay from the Fayyum-Maadi region was used to make a jug, which in many particulars (interior gutter rim, triple-stranded handle, oxidized yellowish-red fabric, and white-filled punctate and grooved design) is similar to the Dolphin Vase and a bird rhyton of standard Tell el-Yahudiyeh ware, all of which were recovered from tombs at Lisht (McGovern et al. 1994: figs. 1 and 5b-c). Potters with the requisite skills were very likely attached to the royal workshops at *jt-t3wj*, and might well have been trained at Tell el-Dab`a or at a site in Southern Palestine. The Dolphin Vase itself, as a peripheral member of the clay group defining the "Gaza group of Middle Bronze Age

sites," was probably made at and exported from an inland Southern Palestinian site (McGovern, et al. 1994). An MB IIA Tell el-Yahudiyeh juglet (JH338, Appendix 1; McGovern, et al. 1994: fig. 5a) which was also imported into Tell el-Dab`a from Southern Palestine is decorated with a line of "fish," possibly dolphins. The dolphin motif of MB IIA Southern Palestine was probably later appropriated by the Minoan culture, which made more extensive use of it on vase painting and frescoes (Czernohaus 1988: 8-19, pl. 10.2-14; see below).

One Canaanite Jar in the NAA corpus (JH736), also dating to the mid-13th Dynasty (MB IIA-B) and of a distinctive marl fabric (sub-type II-a, variously denoted as Marl A3 or B, according to the Vienna System--Bietak 1991b: 327), is very possibly from Upper Egypt (see McGovern 1997a). Both marl II-a and a similar marl fabric (sub-type II-f, Marl F in the Vienna System--Bietak 1991b: 327-28) are better attested at Tell el-Dab`a in the early New Kingdom than in the MB levels, reflecting minimal trade between the Delta and Upper Egypt during the MBA until the Hyksos had been defeated by Ahmose at the beginning of Dynasty 18. Two NAA samples of marl II-f (PMG443 and PMG444, data not included in this volume) from transitional MB IIC-early New Kingdom and early New Kingdom contexts were probably made of the fine marl clay found at Qena, north of Thebes, which is still exploited today to make much of the pottery of Upper Egypt. JH736, although assigned to a different marl sub-type, was chemically most similar to the latter samples. Two other samples (PMG441 and PMG442), recently analyzed and also from transitional MB IIC-early New Kingdom and early New Kingdom contexts, were classified as marl II-a; in mean Euclidean space, they were closest to a large local group of inscribed Canaanite Jars containing wine, meat, oil, "ale" and honey from the palace of Amenhotep III at Malkata, which had probably been made of a local marl clay (classified as Marl D in the Vienna System; see McGovern 1997a).

7. **Other Mediterranean Trade Relations**

In MB IIA, Minoan pottery arrived at the port of Avaris, as attested by three painted sherds from Kamares ware cups (PMG108-110). The well-known alabaster lid inscribed with the name of the Hyksos king Khayan, as well as Canaanite Jars which are reported from Crete (P. P. Betancourt, personal communication) and Tell el-Yahudiyeh, Polished, and Levantine Painted Ware juglets from Thera within the Minoan cultural sphere (Åström 1972a: 415-16, figs. 1-3), point to trade in the reverse direction, probably quite limited and carried out through intermediaries. The "Minoan" frescoes at Tell el-Dab`a (Bietak, et al. 1994: 50-52, and 1996: 73, 80, pls. III-VIII) represent a later tradition, which might also have been mediated through Eastern Mediterranean channels.

Cyprus only becomes an important factor in trade at Tell el-Dab`a in MB IIB-C. Besides probable smaller jars with painted and finger-impressed designs, the largest vessel in the NAA corpus--a handleless pithos of about 40 l capacity--suggests the transport of some substantial goods. Whether the decorated vessels were transported for their own sake inside the pithos, similar to those aboard the later Uluburun merchantman, or were filled (whether with opium, wine, perfumed ointment, pistachio or other nuts, etc.) has not been determined. Copper was probably already being imported from Cyprus, as suggesed by the ships loaded with copper axes mentioned in the second Kamose stela (Bietak, et al. 1994: 48-49).

8. **Local Pottery and Economy**

The large population of Tell el-Dab`a, especially from the later MB IIB period onwards when the site grew to over 2.5 km^2 in area, demanded that local food resources be fully exploited. It is possible that grains might also have been imported from the Levant (Bietak, et al. 1994: 49), as was probably done during the New Kingdom (Ahituv 1978 and Na'aman 1981), but the thriving city-states in this area had their own populations to support.

Besides indicating that imports were generally restricted to specialty items (wine, tree resins, perfumed oils, etc.), the NAA evidence for locally produced pottery supports the view that the Dab`a community relied primarily on native hunting, fishing, agriculture and horticulture in its everyday life, all of which would have been amply rewarded in the well-watered, rich alluvial soil of the Delta. Beginning in the earliest MB levels and continuing throughout the period, almost all the utilitarian pottery in the corpus--including cooking pots, beerjars, ring stands, deep and low-necked Polished "bowls" (jars) which often have incised designs--was generally made of local Nile alluvial clay and recovered from residential contexts. For the most part, such pottery was used to store, process, cook, and serve local foods and beverages.

The local utilitarian pottery can be divided up into two broad stylistic categories, viz., an array of Egyptian-style jars, cups, bowls and other types (Bietak 1991a: figs. 10 and 13), and more specific Syro-Palestinian types, including the MB IIA-IIB handmade flat-bottomed cooking pot, the wheel-made round-bottomed hole mouth cooking pot which occurs throughout the MBA, and various bowl types (platter, carinated, S-shaped, "keeled," etc.), also represented throughout the period.

The predilection for Syro-Palestinian cooking pots is very significant, since it provides compelling evidence that Tell el-Dab`a was controlled, if not originally established, by Levantine people (below). Cooking pots are often the most conservative element in a pottery repertoire, continuing on in the same style for generations and made according to fixed technological traditions, even after new techniques became available and were used in making other pottery types. The conservatism of cooking pot manufacture is closely tied to a well-established cuisine; by using the same cooking pot type, which might even develop special flavors with time, the cook had a better

guarantee of success. The MB IIA period throughout Syria and Palestine is marked by the appearance of new pottery types, whose thin-walled, well-contoured shapes could only be achieved only on a relatively fast wheel. Yet, the main cooking pot type of this sub-period, the flat-bottomed type, is a carry-over of the handmade tradition of EB IV, and its irregular, roughly finished look contrasts with the new wheel-made types. The resilience of the handmade tradition is demonstrated by the fact that two centuries separate the introduction of the wheel from the final displacement of the handmade cooking pot by the wheel-made type.

The types, technology, and temporal sequence of cooking pot types at Tell el-Dab`a are identical to those of many MB settlements in Syria-Palestine, differing only in clay and fabric. The potters who made these cooking pots were therefore solidly within the Syro-Palestinian tradition and did not deviate from the course of this tradition during the 250 or more years of MB occupation at the site. They also gradually began to duplicate standard Syro-Palestinian imported vessel types--Canaanite Jars, Polished jugs and juglets, Tell el-Yahudiyeh juglet, and Levantine Painted Ware--in Nile alluvial clay. Such imitations were a minor part of the Syro-Palestinian pottery repertoire in MB IIA, but become more and more important with each successive sub-period of the MBA. By MB IIC, apart from Canaanite Jars coming from Southern Palestine, "imported" types are almost exclusively of local manufacture.

The development of a local pottery industry in the Syro-Palestinian tradition at Tell el-Dab`a eventually takes on its own character. Early in the MBA, the imitations of Syro-Palestinian pottery types were indistinguishable, stylistically and technologically, from true imports. By MB IIB, when the relative percentage of imitations also noticeably increases, a range of local "Syro-Palestinian" types has emerged, which were further elaborated upon during the remainder of the MBA, including piriform, biconical, and combed varieties of Tell el-Yahudiyeh jugs and juglets (Bietak, et al. 1994: fig. 12) and piriform and globular painted Tell el-Yahudiyeh juglets.

A local pottery industry that produced Egyptian-style jars, cups and other types, probably with its roots going back to at least the 12th Dynasty, supplied a different sector of the economy that did not compete to any great extent with the production of Syro-Palestinian-type pottery. The numerous jar types had long established their usefulness in transporting and storing locally available foods and other goods. For example, Egypt was primarily a barley beer-drinking culture (Helck 1971 and Geller 1992), and specially shaped jars and cups existed for serving and drinking this beverage. Some contact with the native industry of Middle Egypt must also be hypothesized, to explain a similar evolution of Egyptian-style types in both regions during the MBA. An Egyptian-style jar (JH063), made of Southern Palestinian red loess clay and exported to Tell el-Dab`a, suggests that some Egyptian potters were also resident in the Gaza region.

The workshops for the two pottery-making traditions at Tell el-Dab`a probably operated separately from one another, since otherwise it is difficult to explain why the styles and/or techniques of one industry did not impinge on the other (see McGovern 1989, for a theoretical perspective on ancient technological interaction). For example, during the New Kingdom, especially at Beth Shan in the eastern Jezreel Valley where Egyptians controlled the raw material supply and production of Syro-Palestinian pottery types, composite types were developed and clay preparation and firing were adapted to Egyptian standards (James and McGovern 1993). The reverse situation might well have prevailed at Tell el-Dab`a (below), but the potters making Syro-Palestinian pottery, who had newly arrived at the site, apparently chose not to disrupt the status quo by directly cooperating or exchanging expertise or personnel with native potters.

Some locally produced imitations of Syro-Palestinian types--viz., MB IIA-B Polished juglets and platter bowls (undecorated, polished, and red slipped or painted) dating to all sub-periods of the MBA--are restricted to burials. Possibly, these imitations primarily had a ritualistic function at first, although they might also have held food offerings. Later, as the economy of Tell el-Dab`a became more diverse and self-sufficient, "imitations" were likely used as containers for speciality goods that were now produced locally and no longer needed to be imported from the Levant.

Throughout the MBA, a sharp dichotomy also existed between burials accompanied by numerous Polished jugs and juglets made either all of Nile alluvial clay or imported exclusively from Southern Palestine. A single imported Canaanite Jar was sometimes deposited in the entrance chamber to the tomb. Possibly, the interred individual had closer economic, social, and/or ethnic ties with the region where the jugs and juglets in the tomb were made.

9. Possible Ethnic Origins

A prevalent theory has been that the "Hyksos" originally came from Lebanon or Syria. Bietak (1987: 52), for example, once argued that the people from Byblos in Lebanon emigrated to Egypt and founded the "Hyksos" capital of Avaris at Tell el-Dab`a. However, if Syria or Lebanon did figure importantly in the rise of the "Hyksos" in the Delta, then more imported pottery from these regions might be expected at Tell el-Dab`a. More recently, Bietak (1994: 23) has proposed that his original theory be modified, in light of the NAA results, to include a two-stage process, in which the Byblites and other "Amorites" first established bases along the southern Levantine coast, and eventually some segment of this population later moved on to the Egypt.

A Byblite theory can be reconciled with the NAA results in other ways. For example, if the sites in the northern Levant were largely abandoned in late MB IIA, as has been proposed, then there could hardly have been trade between

this region and Tell el-Dab`a, whose Levantine contacts date from this time and later. Or, it could be that whatever was shipped from northern Levantine sites to Egypt (e.g., cedar wood, dyed textiles, semi-precious stones, or metals) was not transported in Canaanite Jars or other Syro-Palestinian pottery types. Such arguments, however, are *a silentio*, and not easily testable. Another possibility is that a clay source exists in the northern Levant, as yet unanalyzed, that is chemically similar to the red loess clay of Southern Palestine. If a such a clay were found in the Byblos area, it would dramatically alter the picture based on the NAA results. Yet, the existence of such a clay is very remote, given the high Mahalanobis probabilities of the imported southern Palestinian group at Tell el-Dab`a vis-à-vis the "Gaza group of Middle Bronze Age sites" and considering the marked chemical differences of known northern Levantine MB pottery groups and the general trend in greater amounts of transition metals, rare earths, alkalis and alkaline earths in the clays and the local compositional groups going from south to north along the Mediterranean coast (above).

It is a well-known dictum that "Pots do not equal People." If the NAA results, however, are "pressed" for information about ethnic origins, then a "Hyksos" origin from Southern Palestine, and secondarily from other parts of the Delta where Semitic peoples had probably already established themselves earlier in the Middle Kingdom (Van Seters 1966), is sufficient to account for the available evidence. The rapid expansion of the site, and presumably the population, of Tell el-Dab`a, especially in late MB IIB, indicate that any local population must have been complemented by outside groups. Because major city-states existed in Southern Palestine throughout the MBA and because of its nearness to the eastern Nile Delta, it is plausible that groups came from here. Based on the pottery evidence, Tell el-Dab`a appears to have been occupied somewhat later in MB IIA than sites along the southern Levantine coast. The latter city-states were growing in size and expanding their economic ties at the same time that a crisis in governance was developing in Egypt, especially in the Nile Delta. The eventual "migration" of some groups from Southern Palestine to Tell el-Dab`a would have been a natural outcome of the already well-established trade connections.

The recent discovery of the MB IIA glacis fortification system and associated levels at Ashkelon has begun to fill in the supposed gap in MB IIA remains in this region. The burial customs of Southern Palestine, often a sensitive indicator of ethnic origins, are very similar to those at Tell el-Dab`a. Tombs in both regions were made of vaulted mudbrick (Stager 1993: 107, describing an LB IA tomb; the architectural type is also attested for burials at Lachish, Tel Aphek, and Jericho), and are sometimes associated with equid or ass burials (Tufnell 1962). Tomb goods, including Canaanite Jars, Polished wares, Tell el-Yahudiyeh juglets, metal weapons and luxury items (Philip 1995), scarabs, and so forth, are virtually identical in the two regions. The concentration of imports from Southern Palestine in some Tell el-Dab`a tombs also accords with an origin and/or close family ties with this region of the Levant.

The city-states of Southern Palestine were built *de novo* early in the MB IIA, and their size, fortifications, and typological affiliations with sites farther north in coastal and inland Lebanon and Syria invite speculation that their origins are to be sought in the latter regions. Even though the indigenous transhumant population of EB IV Palestine probably shared in the transformation of the urban landscape (cf. Dever 1980 and Gerstenblith 1980), the technologies, including large-scale architecture and wheel-throwing of pottery, were northern. This NAA study points to more contacts with the northern Levant in MB IIA, albeit very limited, than in later sub-periods, which accords with this interpretation. Bietak (1994: 52-53) highlights the physical anthropological evidence from Tell el-Dab`a (Winckler and Wilfing 1991) that the population is non-Egyptian, with a male population that is closest to that of early Iron Age Kamid el-Loz in the Biqa`a Valley of Lebanon. Although five centuries separate the two populations and the sexual dimorphism is difficult to explain, this finding, coupled with the pottery evidence, provides a working model for tracing the "urban" origins of the Southern Palestinian city-states and, ultimately, the Hyksos capital at Tell el-Dab`a/Avaris. As more physical anthropological and DNA studies of MB populations are published, a clearer picture should emerge.

From wherever the "Hyksos" came from originally, there can now be no doubt that a major trading partner of Tell el-Dab`a in the northeastern Nile Delta throughout the MBA was Southern Palestine. The rulers of both Tell el-Dab`a and a city-state or region in Southern Palestine, possibly to be identified with a major coastal site such as Ashkelon, are described in comparable Egyptian terms and phraseology on a stamped seal impression on a Canaanite Jar and in the second Kamose stela (above). However, the size of Tell el-Dab`a at its largest extent (ca. 250 ha) exceeds that proposed for the MB IIA city at Ashkelon (as much as 150 ha). One might then argue that Avaris/Tell el-Dab`a was the dominant trading partner, perhaps even controlling Southern Palestine in the later MBA (the Hyksos period proper). Such an explanation might help to explain why very few pottery exports from Egypt have been found at Southern Palestinian sites. On the other hand, gold, with which Egypt was uniquely endowed in the ancient world and which often disappears from the contemporaneous archaeological record because it was later melted down, might have been the payment in exchange for the large amounts of wine, oil, and other speciality goods that were shipped from Southern Palestine to the northeastern Delta. The rich gold jewelry hoards of LB IA Tell el-`Ajjul (Negbi 1970) very likely represent some of the returns on this profitable trade.

Tell Dab`a also maintained contacts with sites a short distance up the Nile in Middle Egypt, but these relations were less important than those with Southern Palestine, according to the NAA results. Much more sampling of sites in the Fayyum and farther up the Nile is needed

before relationships between the Delta "Hyksos," Thebes, Nubia, and other areas in Egypt is understood better.

Even within the Delta itself, as well as along the Wadi Tumeilat where the "Ways of Horus" begin, only a handful of sites have been excavated (e.g., Tell el-Yahudiyeh, Tell Farasha, Tell el-Maskhuta, and Tell Basta), and most of these are poorly published. Indeed, except for two sites west of the Tanitic branch of the Nile River (Van Den Brink 1987: 19), the western and central Delta, where subsidiary "Hyksos" dynasties (e.g., the 14th and 16th) are sometimes located, are an archaeological blank. The known archaeological remains generally date to MB IIB-IIC, post-dating the extensive trade connections that had already been established between Southern Palestine and Tell el-Dab`a where a strong Levantine influence was apparent in the material culture and architecture. Such sites might be interpreted as "satellites" of the larger settlement at Tell el-Dab`a, much like the cluster of smaller sites around the main Levantine coastal city-states of Southern Palestine. On-going analysis of the Tell el-Maskhuta pottery corpus, however, suggests that an idiosynchratic local pottery industry was in operation here, which was minimally affected by developments at Tell el-Dab`a, and that the site's trading connections were very limited (Holladay 1982, and Redmount 1989 and 1995).

10. **Final Observations, and the Role of Scientific Analysis in Archaeology**

Stylistic analysis of ancient pottery has long been appreciated as a valuable relative dating tool in archaeology. More detailed study, ranging from locational and distributional analysis to physicochemical characterization to ethnoarchaeology, has now shown that pottery has much more to tell us about craft activity and organization, socio-economic structure and development, foreign relations, and a host of other cultural concerns (see McGovern 1989 and 1995).

Organic contents analysis extends this detailed pottery investigation one step further. Without diminishing the importance of other kinds of study, one crucial question often goes unanswered: what was the vessel used for? A vessel's function--whether for processing, storage, transport, cooking, or as tableware--may be inferred from its shape and ethnographic analogy. Definitive evidence, however, can only come from chemical analysis of any visible residue or organics absorbed into the fabric of a vessel.

Organic analysis has developed rapidly over the past two decades. Lipids, resins, dyes, perfume ingredients, drugs, proteins, nucleic acids, and other organic compounds have been found to be well enough preserved in certain archaeological contexts--usually either in a dry climate or in a waterlogged environment where microbial activity and autoxidation is reduced--that they can extracted and analyzed using a wide range of available chemical and physical techniques. As these methods are refined further, archaeological chemistry promises to open up whole new chapters in human and environmental history, including ethnicity and genetic development, diet, disease, and materials processing.

As has been shown in this study, the combinination of organic contents analysis with NAA provides a very powerful method in reconstructing ancient trade routes. The proveniences or origins of the fabrics used in making a specific pottery vessel type (in particular, the Canaanite Jar) can be established to a high degree of probability, using the highly sensitive, precise physicochemical technique of NAA. It must be assumed that the pottery vessels were generally made in the same area in which the goods to be transported were produced, but this assumption is a reasonable one in the pre-Hellenistic period and particularly when a relatively large region, such as Southern Palestine, is involved. Thus, during the MBA at Tell el-Dab`a, the resinated wine that was imported from Southern Palestine in Canaanite Jars made of the local red loess clay (above) was most likely a local product of the Gaza region, which was noted for its wine in later times when it was shipped in similar amphora types, ultimately derived from the Canaanite Jar, throughout the Mediterranean. Future organic analyses of the other major pottery classes in the NAA corpus-- including Polished, Painted, Tell el-Yahudiyeh, and Egyptian types--may well provide additional evidence for significant economic activity that will be crucial in understanding the production and exchange networks of the period.

The NAA study also opens up a new perspective on the pottery industry at Tell el-Dab`a, which in turns points to unexpected social and possibly political relations at the site. Pending future excavation, workshops for producing standard Egyptian pottery types and Syro-Palestinian imitations, using the locally available Nile alluvial clay, can be hypothesized to have operated independently of one another. Interactions between the native industry and that which had probably been introduced and sustained by potters from Southern Palestine were virtually non-existent throughout the MBA, and is contrary to what might have been expected for an increasingly integrated and self-sufficient economy. This finding, together with the fact that cooking pots at the site are Syro-Palestinian in type and follow the same conservative pattern in handmade production as elsewhere in the Levant, is a strong indicator that groups from Southern Palestine, probably including individuals with a variety of specialized skills in addition to pottery-making, emigrated to the northeastern Nile Delta during the course of the MBA. Moreover, the lack of interaction with native potters and a strong predilection for their own traditions, as exemplified by using their customary cooking pots for preparing their cuisine, strongly suggests that the incoming peoples held higher social and political positions in the society. The contemporaneous Kamose stelae, as well as the later Manethoan tradition, is fully in accord with this interpretation.

This NAA study is extremely important in refining

hypotheses and conclusions based on other kinds of pottery study. For example, distributional and geographical analysis of certain Syro-Palestinian pottery types, features and painted designs, which are represented at Tell el-Dab`a, has sometimes strongly implied a northern Levantine or even Anatolian concentration. A high concentration of pottery of a specific type in one region and its relative paucity elsewhere is often good evidence that its production was limited to the one region. NAA has an advantage over stylistic analysis, however, because the actual clays used in making the pottery, and hence the most probable locations of the pottery workshops themselves, can determined to a very high level of probability. In this study, the NAA results have shown that the "northern" pottery types were imported into Tell el-Dab`a from Southern Palestine, a conclusion clearly at odds with the stylistic distributional analyses. The clear implication is that MB sites in Southern Palestine have not been sufficiently excavated and/or published, so that the "northern" types are under-represented in the distributional studies. The recent excavations at Ashkelon have shown that this hypothesis, which takes the NAA results at face value, will very likely be borne out by further investigation.

The NAA results constitute an implicit test of the Vienna system of pottery fabric classification, which is based on macroscopic and sub-microscopic observations of clay texture, inclusions, and firing. This study has shown that the vast majority of fabric assignments according to the Vienna system are supported by the NAA data. Differences in assignment, however, were noted for the Marl C fabric, which derives from an Upper Eocene clay deposit in the Fayyum-Maadi region. Marl C appears to have been confused sometimes with an imported Levantine fabric (Tell el-Dab`a type IV). Such misassignments are understandable, because of similar geological regimes in Egypt and the Levant, related to incursions of the Mediterranean Sea. Fabrics defined by the Vienna system are probably also more a function of workshop procedures in clay preparation, addition of temper and firing, than of clay origins. Thus, Marl D, a popular New Kingdom amphora fabric, has a similar appearance at northern and southern sites, but was most likely made from different clays in the two regions (McGovern 1997a). Two unusual MB IIA fabrics (sub-types IV-5 and IV-6) of presumed Levantine origin were also shown in the follow-up NAA study to be less amenable to precise characterization than previously hypothesized (see Bietak 1991b: 329-30).

It is rare that a technical pottery study entails rewriting history, or, at least, archaeological hypotheses. But according to the Neutron Activation Analysis results presented here, the very earliest contacts of the "Hyksos" at Tell el-Dab`a/Avaris were overwhelmingly with its nearest Levantine "neighbors" in Southern Palestine and not farther north, and this pattern continued throughout the MBA. Other kinds of evidence--including palaeogenetic and physical anthropological data, contemporaneous texts, etc.--will be needed, in conjunction with the NAA results, before the issue of population dynamics and its resultant economic, social and political repercussions during the Middle Bronze Age can be definitively resolved.

ABBREVIATIONS

AIA	Archaeological Institute of America
AAAS	*Annales archéologiques arabes syriennes*
AASOR	Annual of the American Schools of Oriental Research
ADAIK	Abhandlungen des Deutsches Archäologisches Instituts Kairo, Ägyptologische Reihe
Ä&L	*Ägypten und Levante*
AJA	*American Journal of Archaeology*
Aph	*Anzeiger der Philosophisch-historischen Klasse der österreichischen Akademie der Wissenschaften.*
ASAE	*Annales du Service des Antiquités de l'Egypte.*
BA	*Biblical Archaeologist*
BASOR	*Bulletin of the American Schools of Oriental Research*
BCH	*Bulletin de Correspondance Hellenique*
BIAL	*Bulletin of the Institute of Archaeology, London*
BMB	*Bulletin du Musée de Beyrouth*
BSAE	British School of Archaeology in Egypt
DAIK	Deutsches Archäologisches Institut, Abteilung Kairo
EI	*Eretz-Israel*
EEF	Egypt Exploration Fund
ERA	Egyptian Research Account
IEJ	*Israel Exploration Journal*
IFAPO	Institut Français Archéologique du Proche-Orient
JAS	*Journal of Archaeological Science*
JEA	*Journal of Egyptian Archaeology*
JFA	*Journal of Field Archaeology*
LAAA	Liverpool Annals of Archaeology and Anthropology
MASCA	Museum Applied Science Center for Archaeology
MDAIK	*Mitteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo*
OIP	Oriental Institute Publications
OJh	*Jahreshefte des Österreichischen Archäologischen Instituts*
Or	*Orientalia*

PEF	Palestine Exploration Fund
PEQ	*Palestine Exploration Quarterly*
PMB	*Bulletin of the Palestine Museum*
RB	*Revue Biblique*
QDAP	*Quarterly of the Department of Antiquities of Palestine*
SAGA	Studien zur Archäologie und Gechichte Altägyptens
SMA	Studies in Mediterranean Archaeology
UÖAI	Untersuchungen der Zweigstelle Kairo des Österreichischen Archäologischen Institutes
ZDPV	*Zeitschrift der Deutschen Palästina-Vereins*

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ILLUSTRATIONS AND SAMPLE DATA

It would have been most desirable to include the pottery line-drawings for the Tell el-Dab`a pottery in this volume, since they conveniently summarize the details and nuances of the pottery typology. This author had a substantive, creative input into the preparation of these figures by checking their accuracy, establishing straight-forward, informative conventions (see below), and working closely with the artists to bring this part of the project to completion. They were subsequently approved by Dr. Bietak.

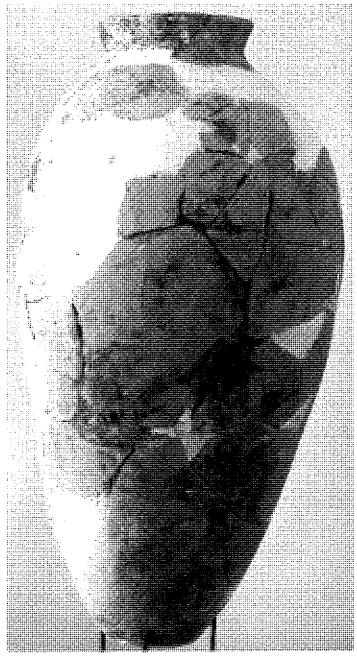
In the end, however, it was deemed best not to pre-empt Dr. Bietak in making this material available to the scholarly world. Many readers will have access to primary sources, so that they can consult drawings of the published pottery. From these, they can infer what typological variations are being described in the text. The pottery photographic plates in this volume provide additional help; permission to use them was generously given by the Kunsthistorisches Museum in Vienna. When these resources and inferences prove inadequate, the interested reader is kindly requested to write directly to Dr. Bietak c/o the Austrian Archaeological Institute, University of Vienna, Frankfasse 1, A-1090 Vienna, Austria (FAX: 43-1-405-430090; e-mail: manfred.bietak@univie.ac.at), to obtain copies of the pottery figures.

In lieu of the line-drawings, a representative selection of the principal pottery classes (Canaanite Jars, Polished and Painted Wares, and Miscellaneous types), together with some unusual decorative features and forms (e.g., cut-away spouts, seal impressions, incised and painted designs, imported Minoan and Cypriote pottery, etc.), are illustrated in the photographic plates.

The plates are arranged by principal classes, according to sub-period (Middle Bronze IIA, IIA-B, IIB, IIB-C, IIC, and later or questionable dating), and within each period by ascending NAA no. (denoted by the initials of the individual who collected the sample--Joan Huntoon [JH], Manfred Bietak [MB], or Patrick McGovern [PMG]). Appendix 1 should be consulted for complete information about an artifact.

a

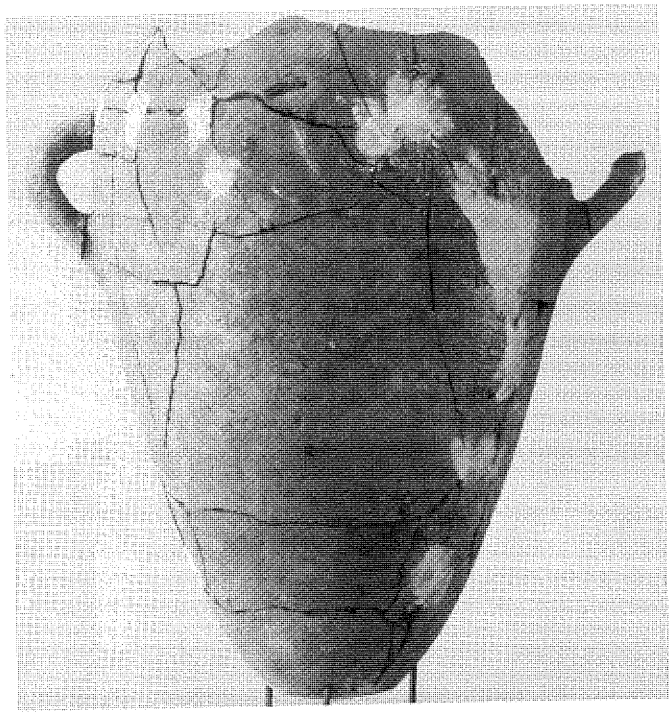
b



c

d

Plate 1. MB IIA and IIA-B Canaanite Jars: a. JH089; b. PMG119; c. PMG120; d. JH094. Scale 1:5



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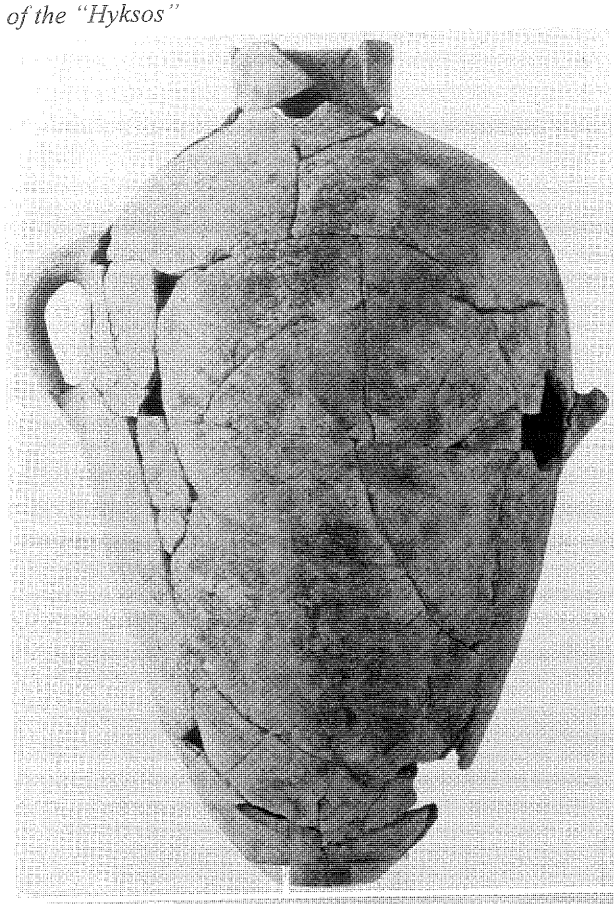

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c

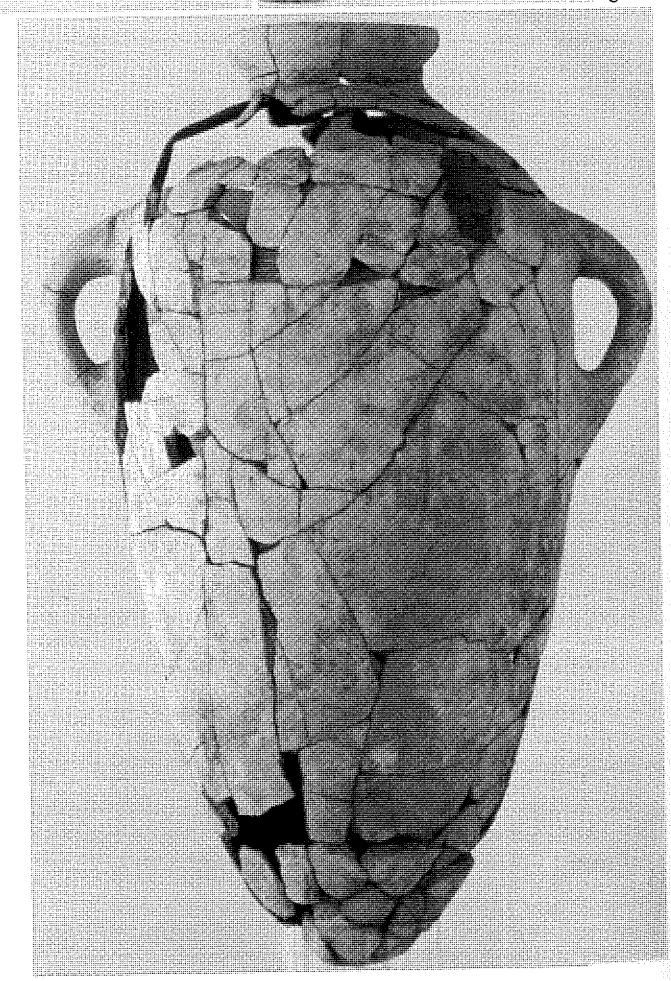

Plate 2. MB IIA-B and IIB Canaanite Jars: a. JH611; b. JH657; c. JH117=JH118; d. JH264. Scale 1:5

a

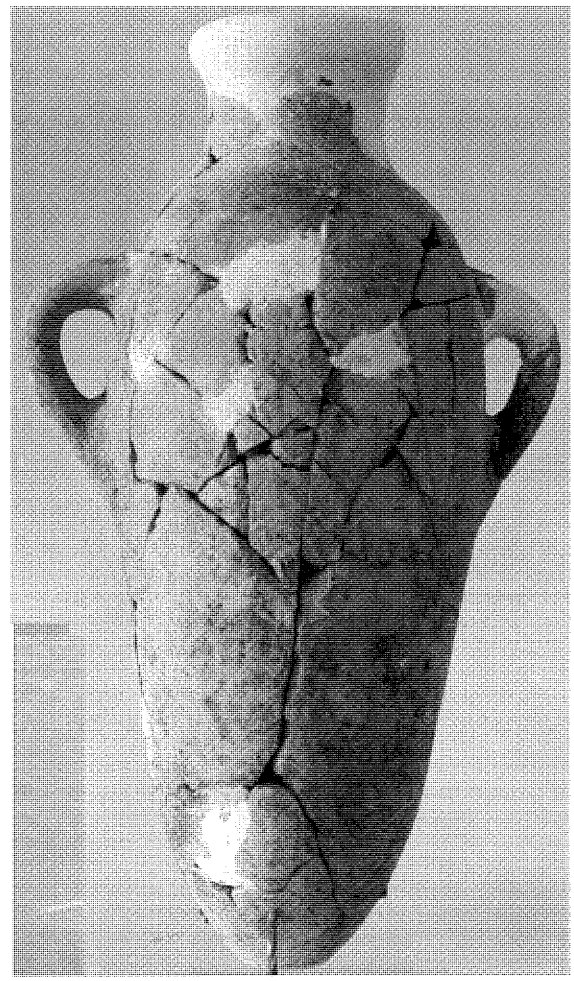

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Plate 3. MB IIB-C Canaanite Jars: a. JH980; b. JH981. Scale 1:5

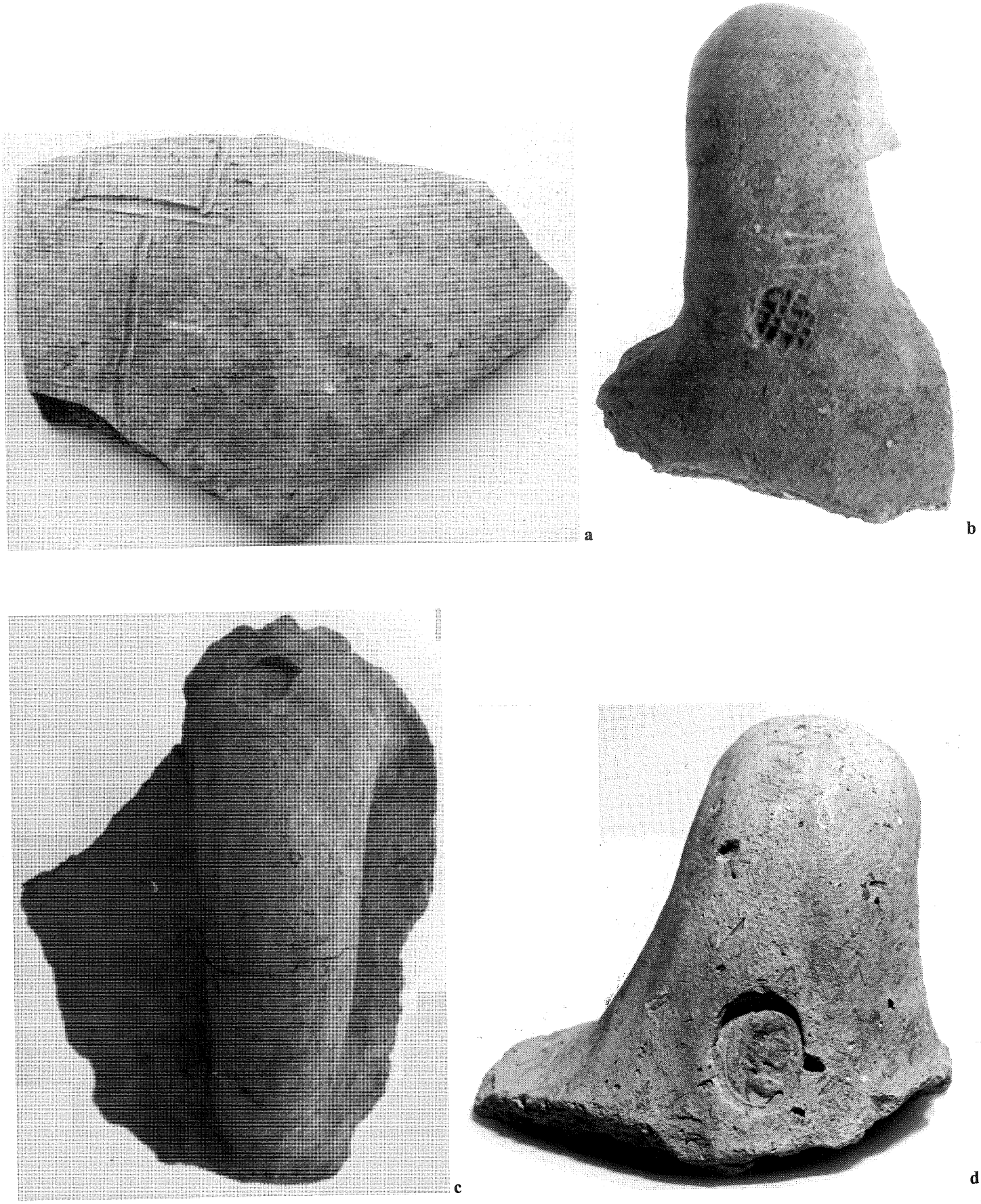
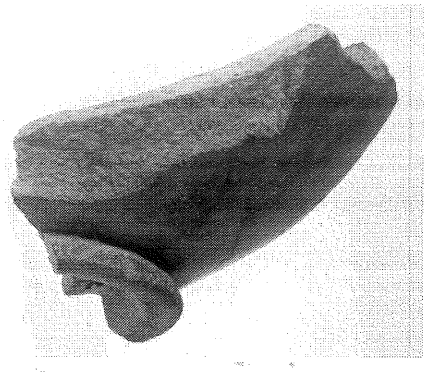
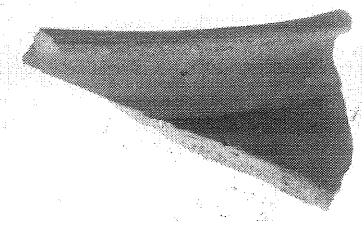


Plate 4. Canaanite Jars: Incised Body Sherd and Stamped Handles of MB IIA-B, IIB, and Questionable Date: a. JH010; b. JH873; c. JH256; d. JH253. Scale a-b 1:1; c-d slightly reduced



a



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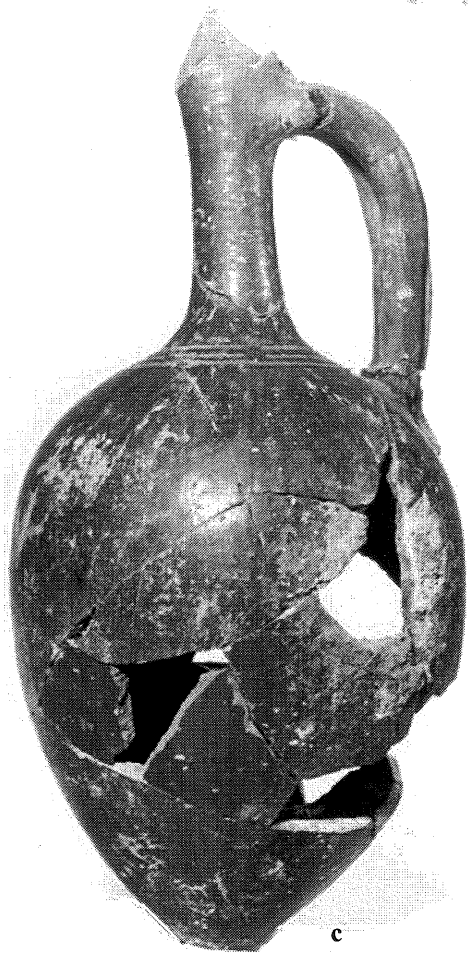

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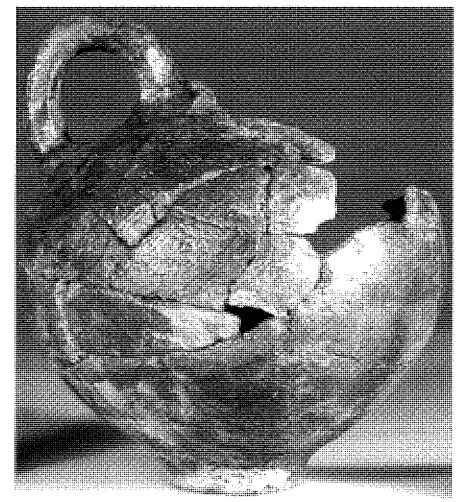
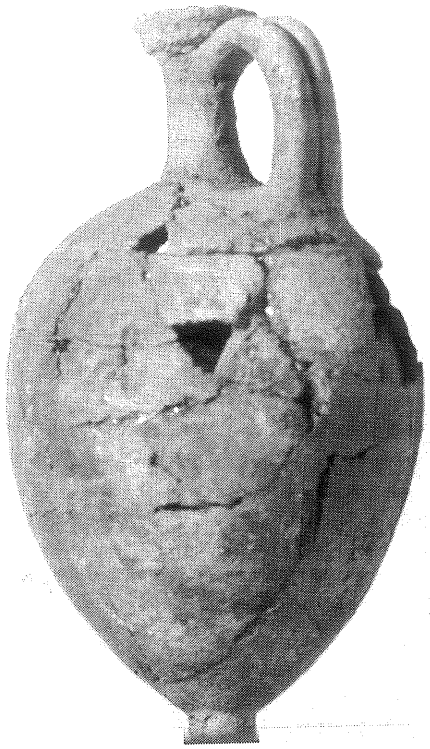
e

f



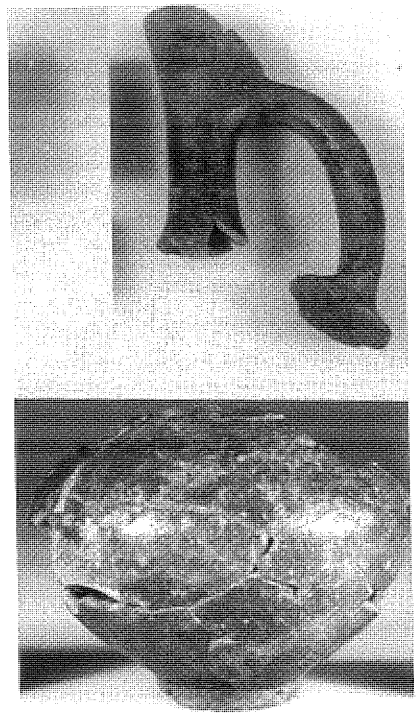
g

Plate 5. MB IIA and IIA-B Polished Juglets, Rims, and Bases: a. PMG103; b. PMG105; c. JH316; d. JH354; e. JH355; f. JH358; g. JH329. Scale a-b: 1:1; c-g: 3:5



a

b



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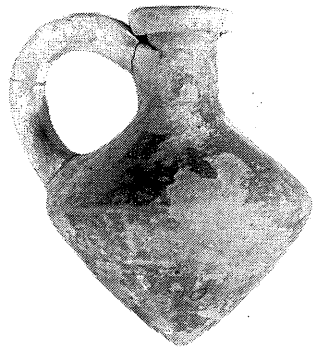

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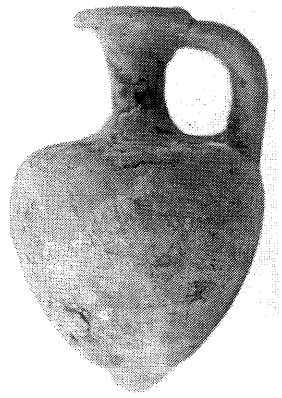
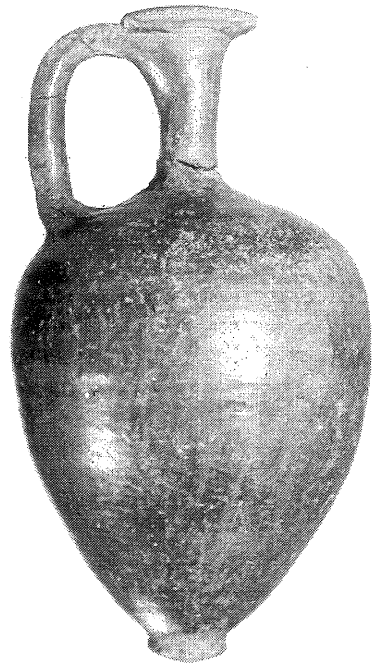


i

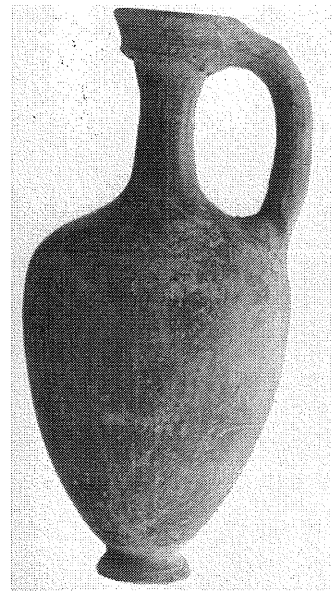
Plate 6. MB IIA-B and IIB Polished
Juglets: a. JH334; b. JH365; c. JH371; d.
JH363; e. JH270; f. JH271; g. JH272; h.
JH274; i. JH320. Scale all 3:5 except g
1:1.



a

b

c



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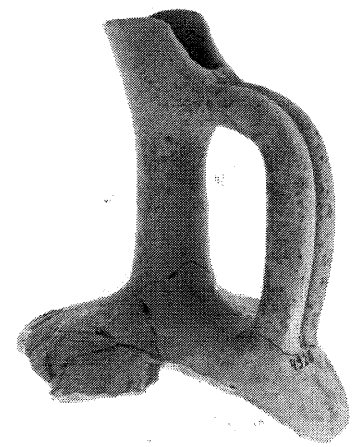
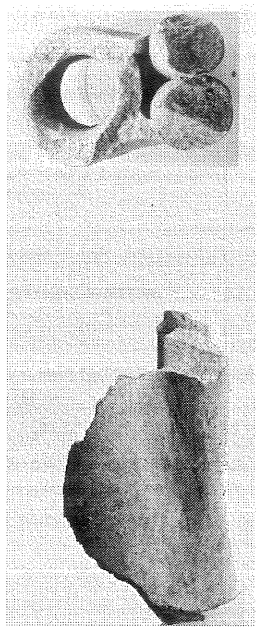


e

Plate 7. MB IIB Polished Juglets: a. JH347; b. JH356; c. JH374; d. JH375; e. JH899. Scale 3:5

Plate 8. MB IIA, IIA-B, and IIB-C Polished Dipper Juglets: a. JH102; b. JH858; c. JH103; d. JH854; e. JH340. Scale 3:5



a

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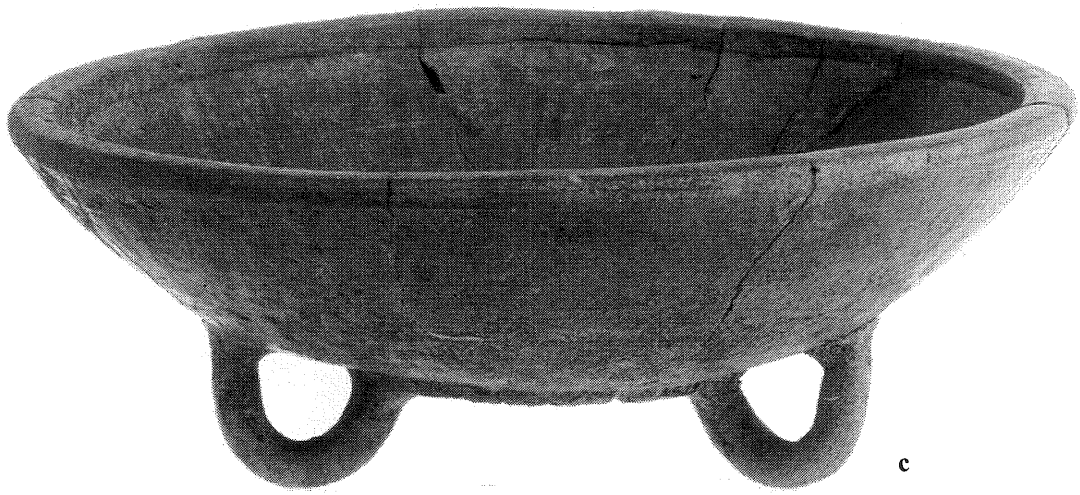

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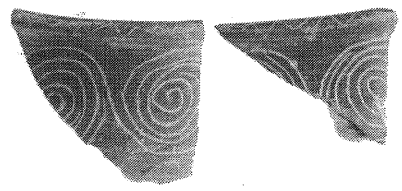


d

Plate 9. Probable Polished Juglet Neck with Two-Stranded Handle, Carinated Bowls, and Platter Bowl of MB IIA-B and IIB: a. JH906; b. JH343; c. JH106; d. JH830. Scale 3:5

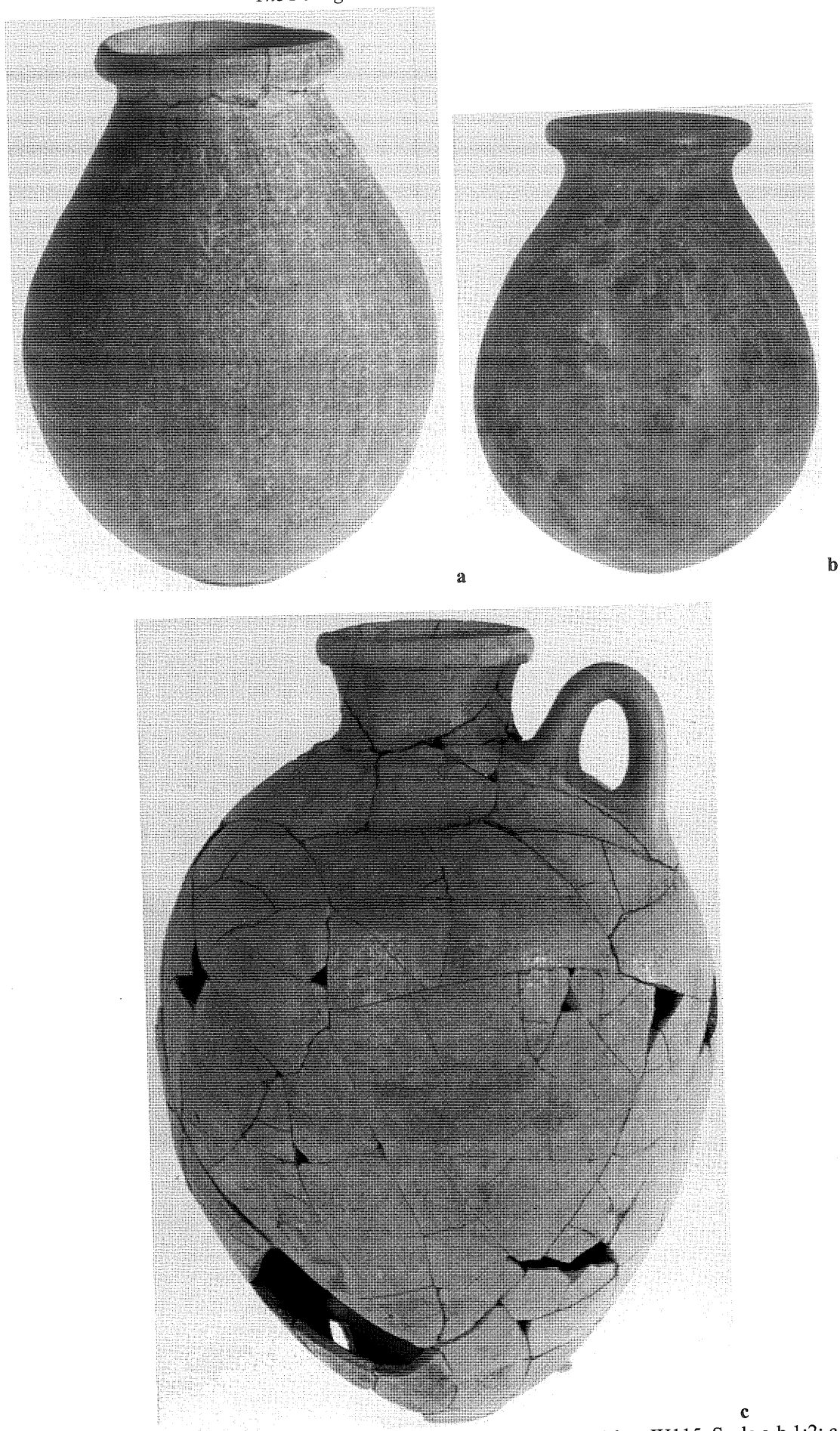


Plate 10. MB IIA-B Deep Globular Jars and MB IIA Amphora Jug: a. JH885; b. JH886; c. JH115. Scale a-b 1:2; c 1:3

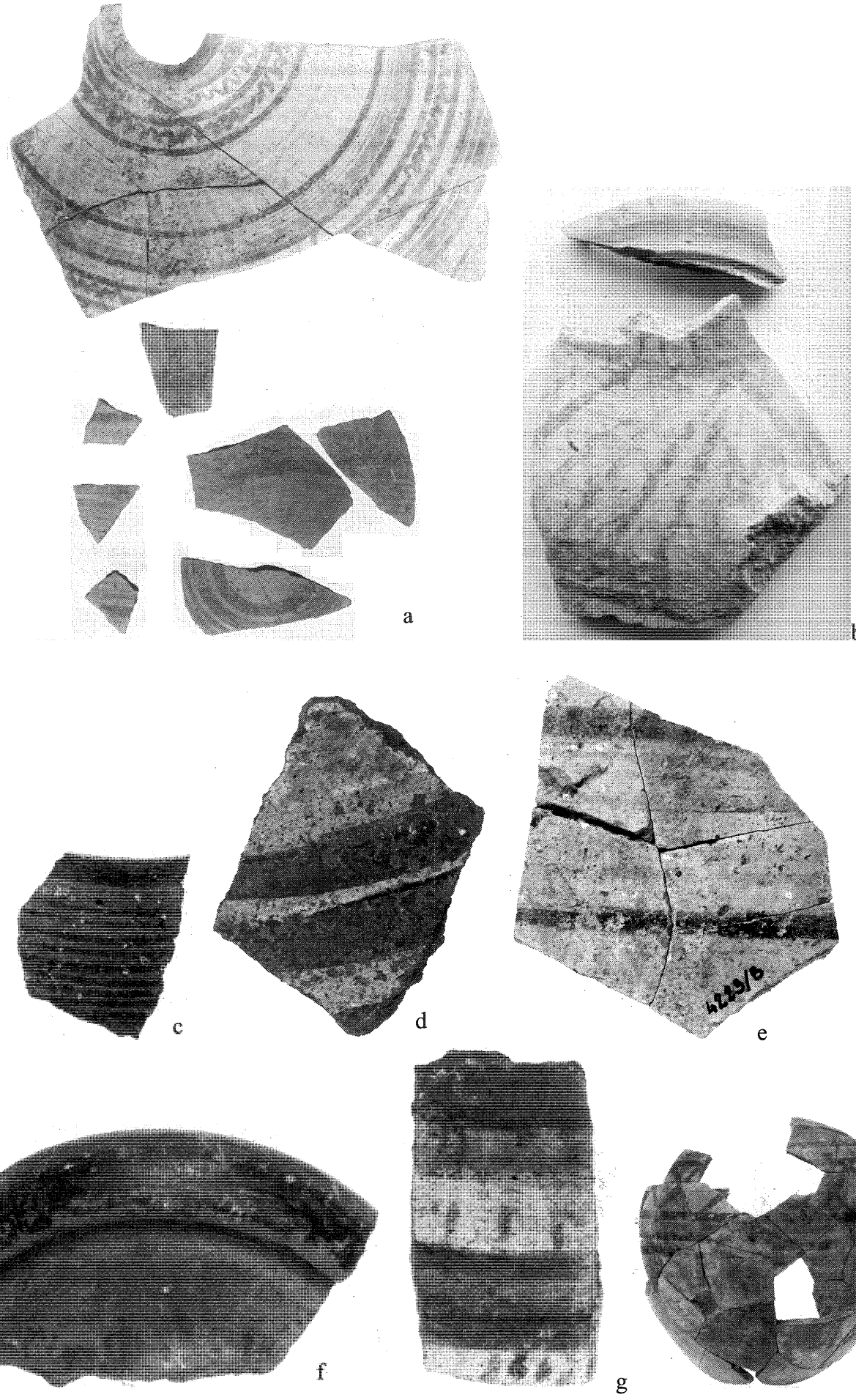


Plate 11. MB IIA Painted Jars/Jugs and Juglets: a. JH831; b. JH901; c. JH837; d. MB013; e. MB016; f. MB018; g. MB022; h. MB027. Scale a,b 3:5; c-g 1:1; h 1:3

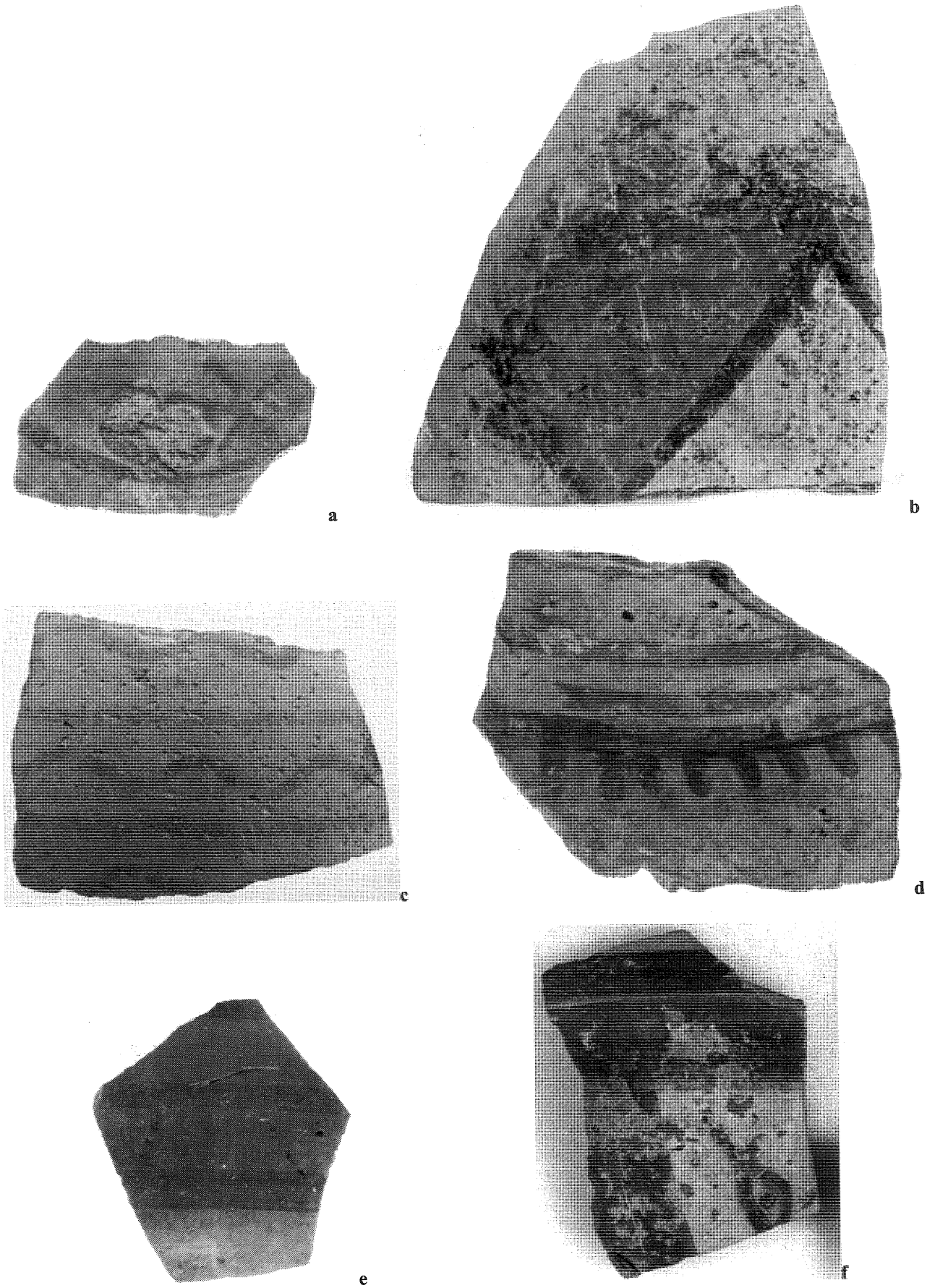
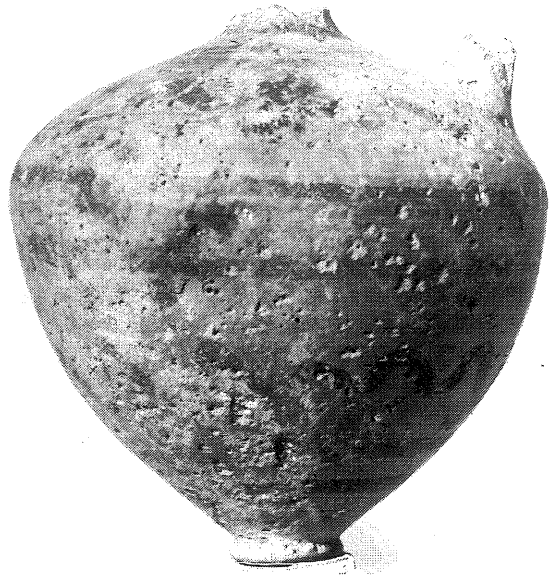


Plate 12. MBA Painted Jars/Jugs and Juglets: a. MB028; b. MB029; c. JH295; d. MB017; e. MB032; f. JH331. Scale 1:1



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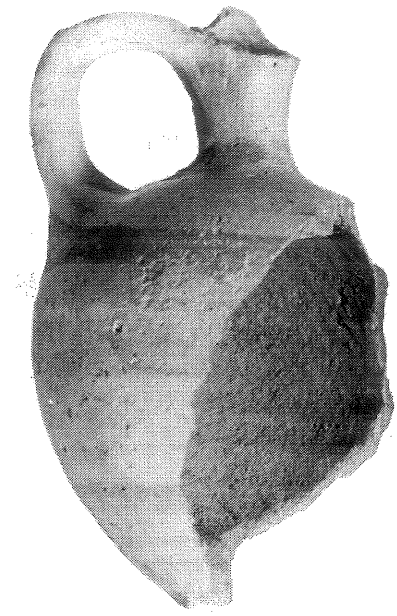

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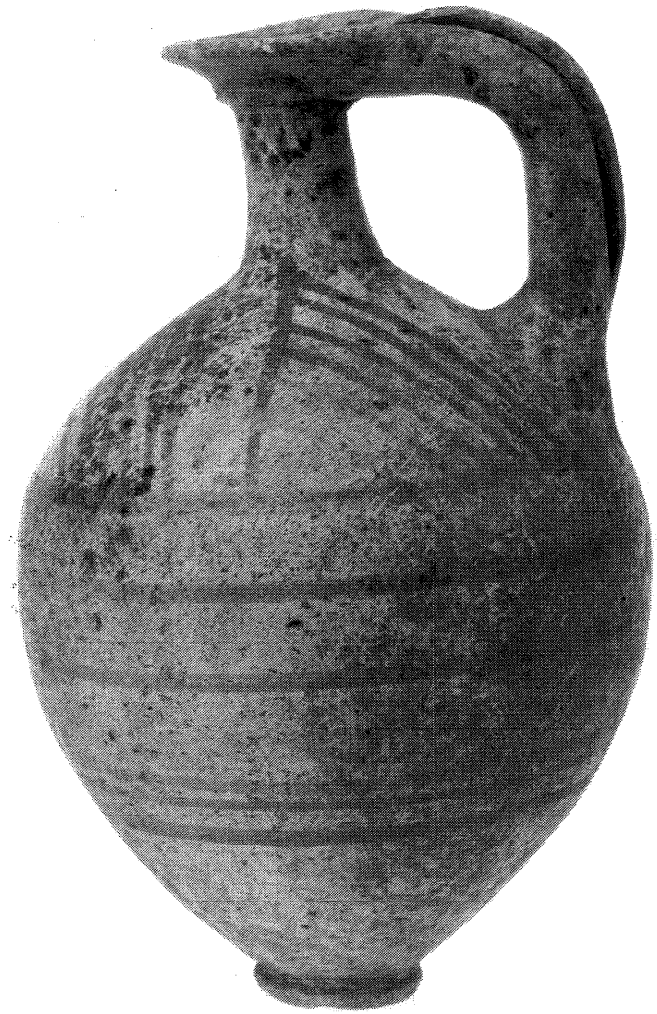
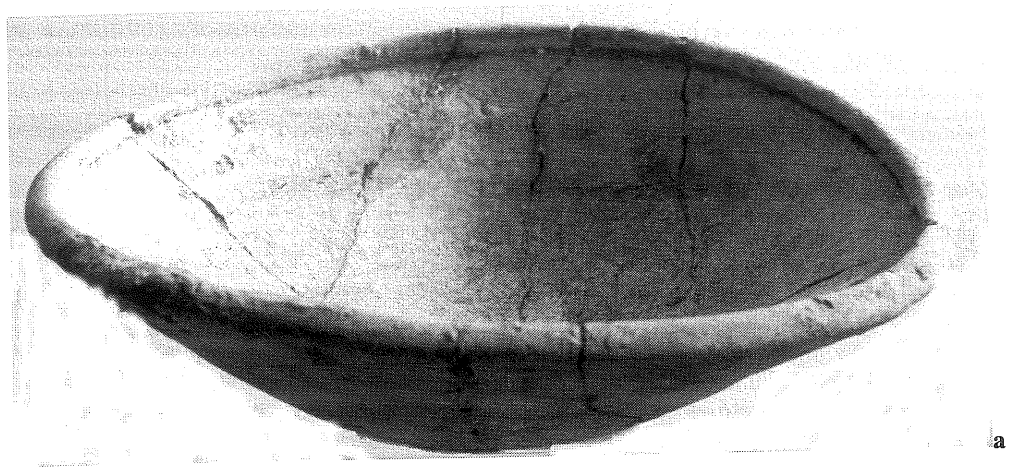
c

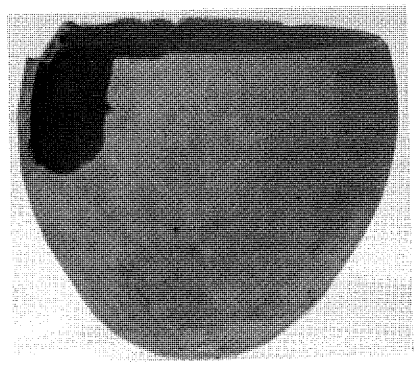


d

Plate 13. MBA Painted Jars/Jugs and Juglets: a. JH318; b. JH317; c. JH864; d. JH822. Scale 1:1


a

b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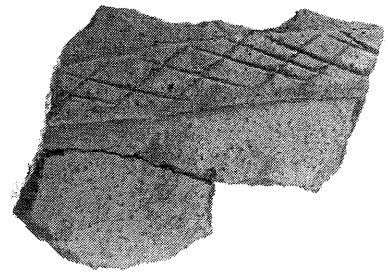

d

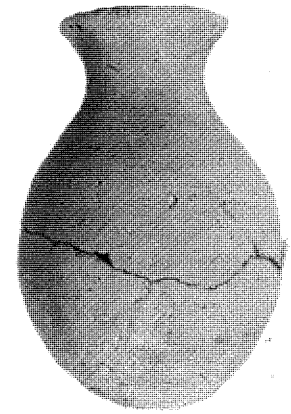
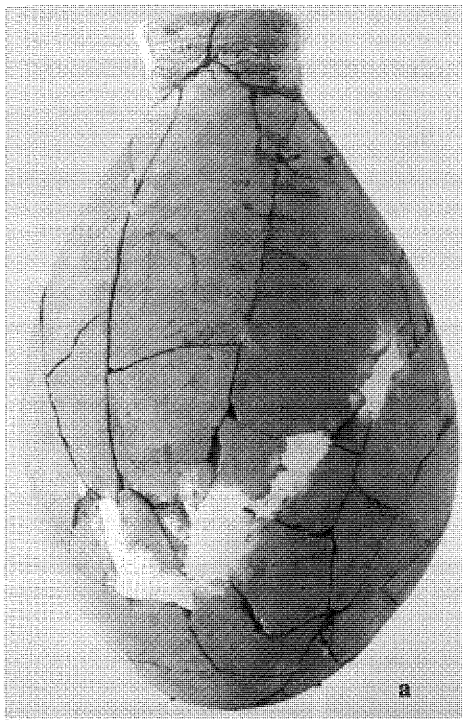
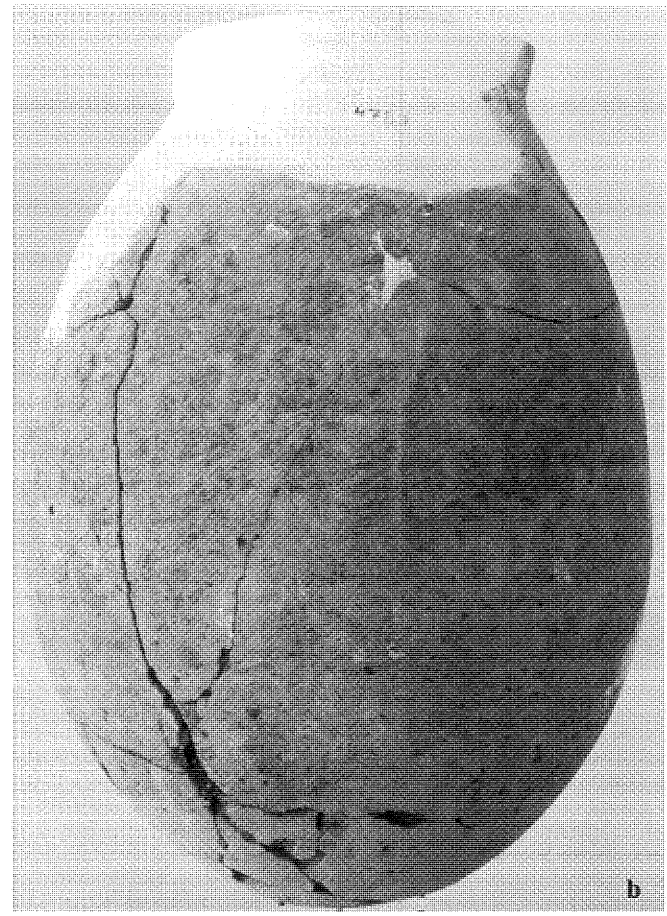
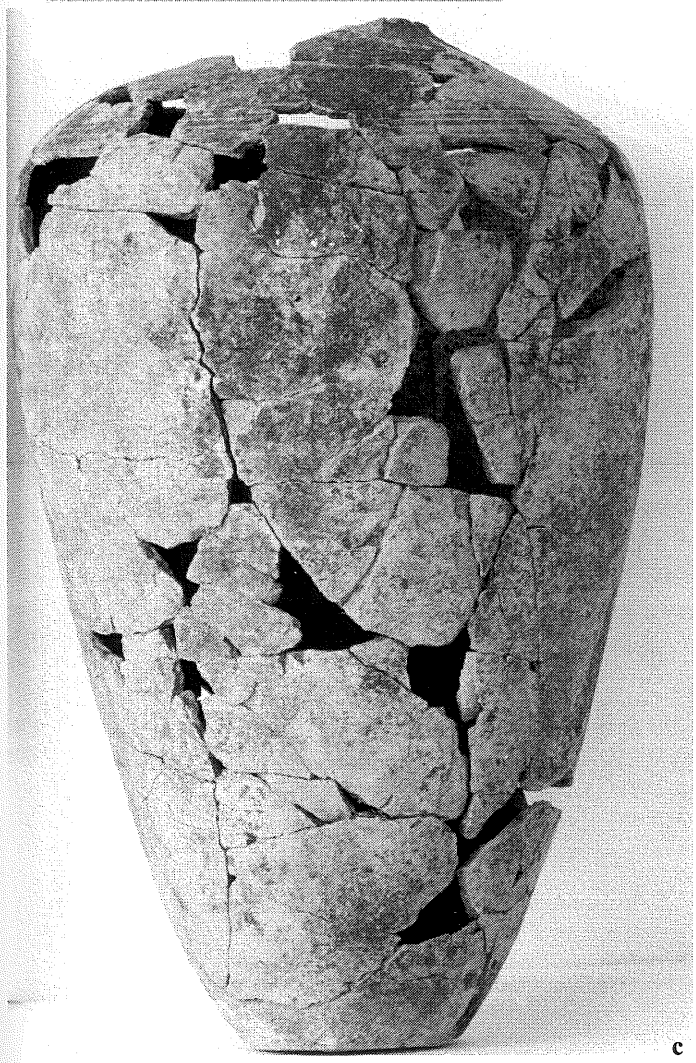

e

Plate 14. MBA Platter Bowls, Cup, Hole-Mouth Cooking Pot with Rope Appliqué, and Miniature Jar: a. JH342; b. JH861; c. JH718 d. JH832; e. JH345. Scale a-d 1:2; e 3:5







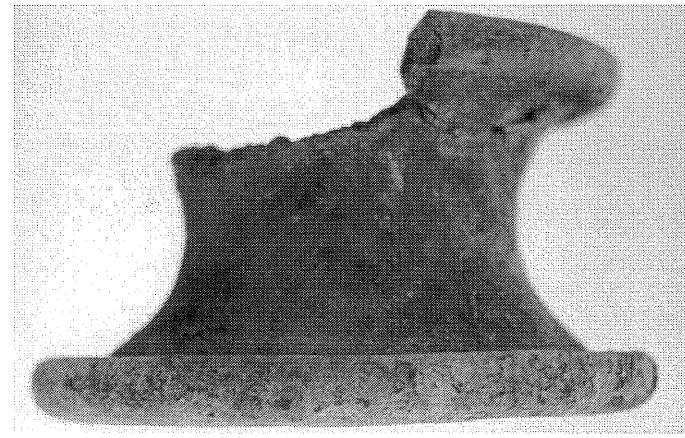


Plate 15. MBA Jars and Ring Stand: a. JH658; b. JH704; c. JH909; d. JH339. Scale a-c 1:5; d 1:2

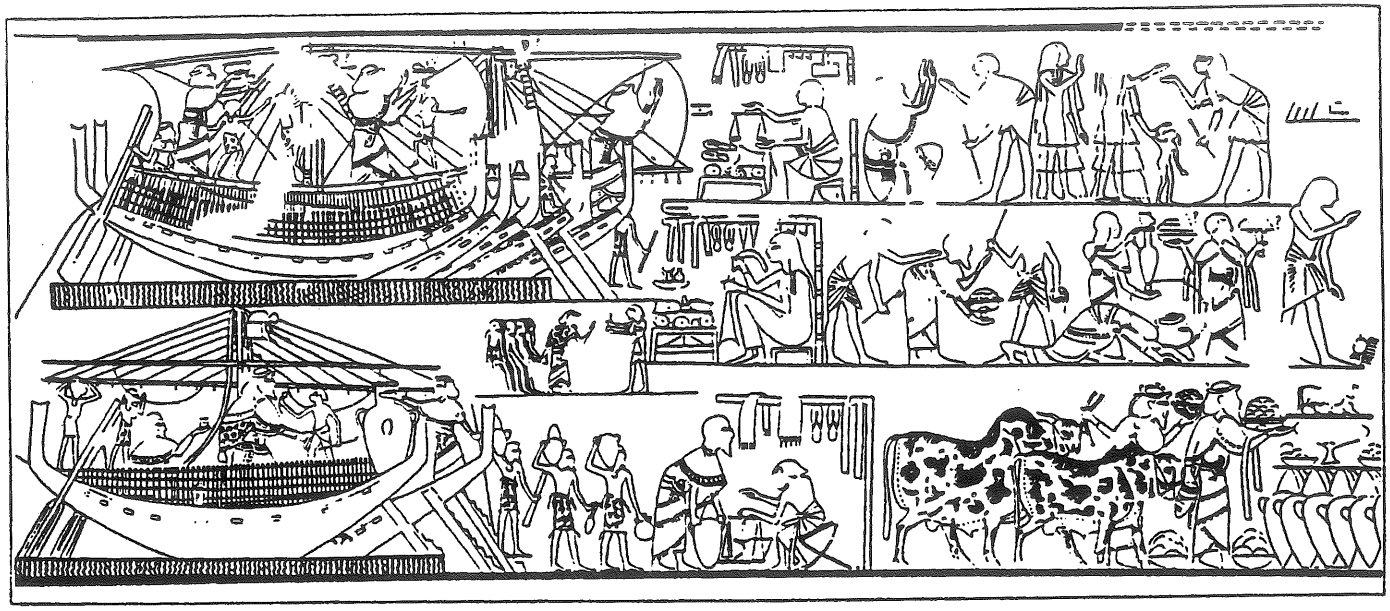


Plate 16. Canaanite Jars and other goods being off-loaded from ships and registered, from the 18th Dynasty tomb of Kenamun. (After N. DE G. DAVIES and R. O. FAULKNER, *JEA* 33 [1947], pl. 8; courtesy of the Egypt Exploration Society)

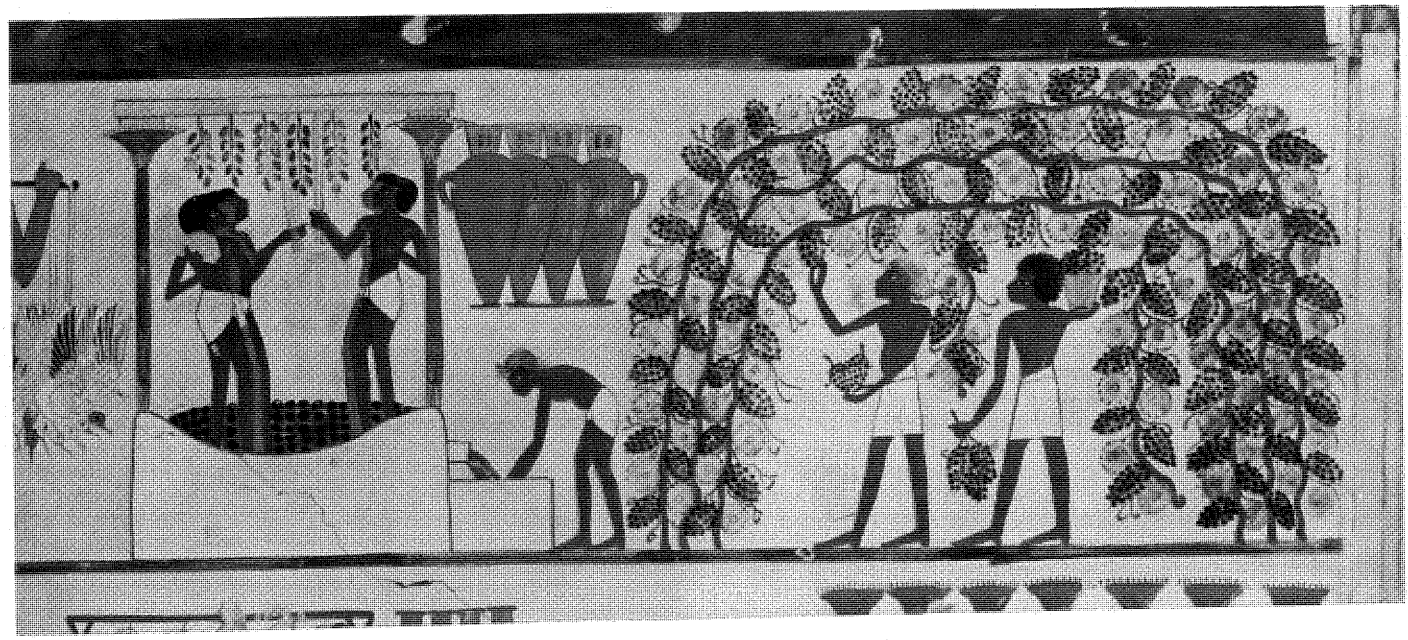


Plate 17. Vintage scene from the tomb of Nakht, western Thebes, end of the reign of Amenhotep II or beginning of the reign of Tuthmosis IV (ca. 1400 B.C.). (After N. DE G. DAVIES 1917: pl. 26; courtesy of The Metropolitan Museum of Art, no. 15.5.19e [facsimile painting], Rogers Fund, 1915.)

APPENDIX 1

CATALOGUE OF NEUTRON ACTIVATION ANALYSIS SAMPLES TELL EL-DAB`A, IN ORDER OF SAMPLE NUMBER[1]

*JH001
Tell el-Dab`a
K395
Canaanite Jar body sherd
IV-2c
AII m/14, pl. 4-5 (residence)
E3; MB IIB
NAA Provenience: Southern Palestine

JH002
Tell el-Dab`a
K411
Juglet base
IV-2b
AII l/14-15 (residence)
D2-3; MB IIB-C
NAA Provenience: ?; most similar to Sirkeli AGSR23, of uncertain provenience (mean Euclidean distance 0.077)

JH003
Tell el-Dab`a
K388
Canaanite Jar handle
IV-1c
AII l/14, pl. 4-5 (residence)
E3-F; MB IIA-B
NAA Provenience: most similar to Southern Palestine (Mahalanobis distance probability 0.5%; mean Euclidean distance 0.077)

*JH004
Tell el-Dab`a
K395
Canaanite Jar handle
IV-3b
AII m/14, pl. 4-5 (residence)
E3; MB IIB
NAA Provenience: Southern Palestine

*JH008
3983
Tell el-Dab`a
Canaanite Jar
IV-3b
FI j/22, pl. 3, gr. 29 (burial)
c; MBIIA
NAA Provenience: Southern Palestine

*JH009
Tell el-Dab`a
3986
Canaanite Jar, complete up to neck
IV-3b
FI j/22, pl. 3, gr. 29 (burial)
c; MB IIA
NAA Provenience: Southern Palestine

*JH010 (Pl. 4a)
Tell el-Dab`a
Canaanite Jar, body sherd with incised mark
4060D
IV-2b
FI i/23 (residence)
b3; MB IIA-B
NAA Provenience: Southern Palestine

*JH011=JH904
Tell el-Dab`a
4108E
Canaanite Jar, rim and neck
IV-1b
AII l/17, pl. 5 (residence)
E2-3; MB IIB
NAA Provenience: Southern Palestine

*JH012
Tell el-Dab`a
4536A
Canaanite Jar, complete up to midbody
IV-2c
FI k/24 (residence?)
a2; MB IIB-C
NAA Provenience: Southern Palestine

JH013
Tell el-Dab`a
4537A
Canaanite Jar, complete up to midbody
IV-1c
AII l/17, gr. 17 (burial)
E3 or F; MB IIA-B
NAA Provenience: ?; most similar to Southern Palestine (Mahalanobis distance probability 0.2%; mean Euclidean distance 0.074) and Fayyum-Maadi marl clay (Mahalanobis distance probability 0%; mean Euclidean distance 0.050)

*JH014
Tell el-Dab`a
4538A
Canaanite Jar, complete up to upper body
IV-1c

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[1]Asterisked samples are members of the Southern Palestinian regional chemical group; local Nile alluvial chemical groups are designated by the pound sign, and samples made of Fayyum-Maadi marl clay are indicated by a dollar sign (see Tables 8-11 and 13).

Each Tell el-Dab`a pottery entry includes the Neutron Activation Analysis (NAA) number, the site (Tell el-Dab`a) and a reference to any drawing already published in the final publication for Area AII (Bietak 1991b--here abbreviated *Tell el-Dab`a V*), followed by the registration or K (Ger. Konvolut, "form") number, a short description of the pottery type, the macroscopic fabric classification, the field, area and sometimes sub-area (abbreviated pl., Ger. Planung) or grave (abbreviated gr., Ger. Grabung) number(s) followed by M. BIETAK's contextual assignment in parentheses, the level(s) and MB (Middle Bronze) phase(s), and the NAA provenience.